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Quick Scan of Kenya's Forage Sub-Sector

Netherlands East African Dairy Partnership (NEADAP)

Working Paper Supplement: Survey Diagrams and Questionnaire

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This Supplement is part of the Kenya Forage Sub-Sector Quick Scan or Working Paper and includes the Survey Diagrams and the Questionnaire. The Working Paper describes Kenya's forage sub-sector and looks at the current situation of available forage species and their quality, seasonality, preservation, forage seeds and planting material, fertilizer use, mechanisation, inputs and services, the forage market, education and training, innovations, environmentally sustainable forage production and policies and regulations affecting the forage sub-sector. The Working Paper identifies gaps and gives recommendations to enhance availability of quality forages. It is a reference document for the development of a Strategy Paper and/or Policy Brief under Theme 2: Forages and nutrition of dairy cows, of the Netherlands East African Dairy Partnership project (NEADAP). NEADAP is an initiative by the Netherlands government for learning and sharing amongst different dairy sectors and projects in East Africa.

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Survey Diagrams

1. General Constraints

Figure 1.1. Question 2 "Select the five most important constraints that prevent an increase in forage production and preservation in Kenya". Availability of forage seeds or plant material is the biggest hindrance to improved forage production (15.2%), together with lack of awareness, knowledge and skills (15.2%) how best to grow and make use of forages in an effective way. This is followed by low level of mechanisation (12.7%) and competition over land use by food for human consumption (10.2%) (Survey Diagrams; Figure 1.1).

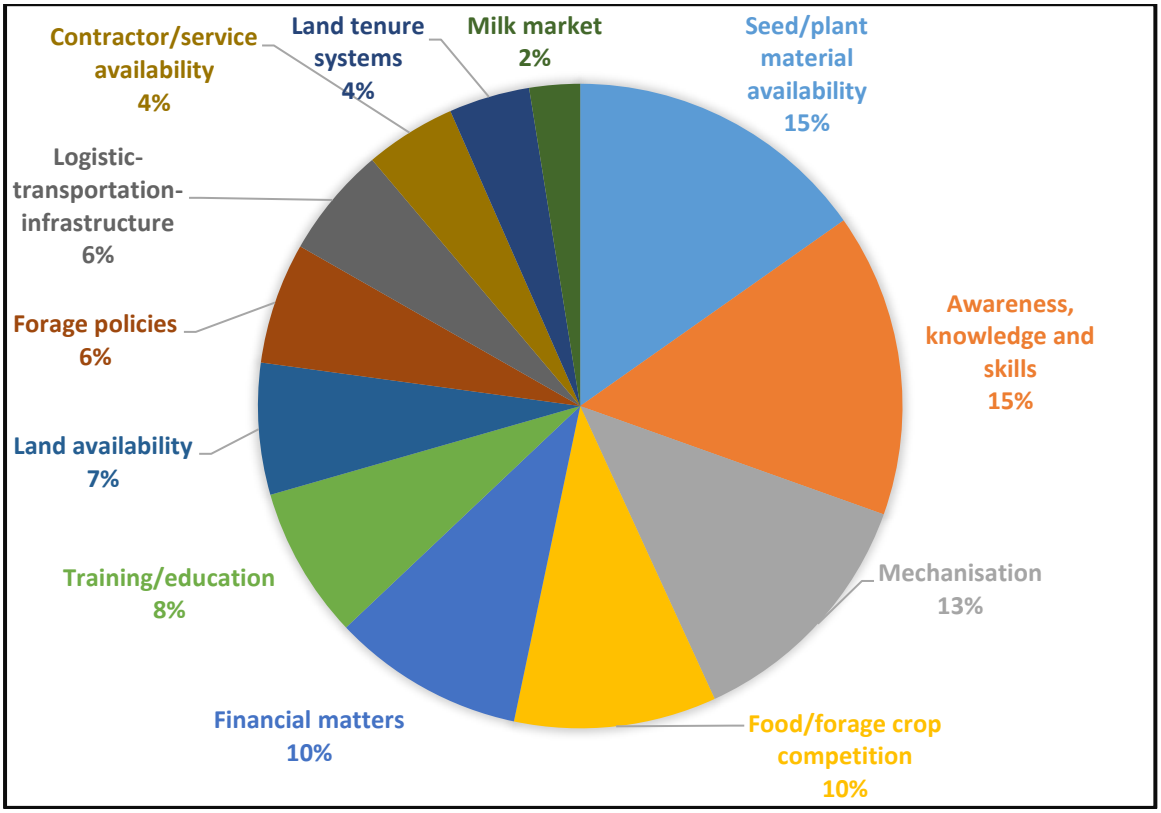
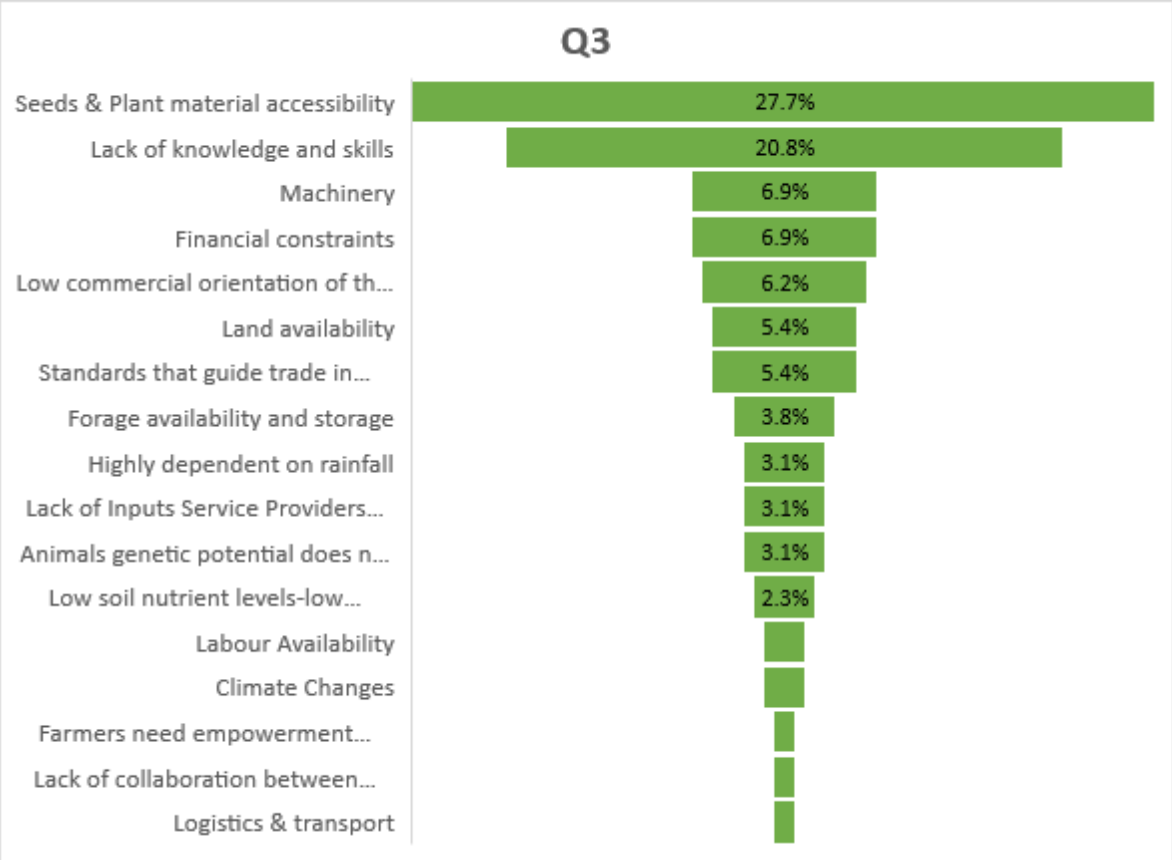


Figure 1.2. Question 3. "List at least three important reasons why in Kenya production of quality forages (high nutritive value) is still deficient". Likewise, 27.7% of the respondents mention seeds and planting material as the root cause along with lack of knowledge and management skills (20.8%). Availability of land (5.4%) only comes after mechanisation (6.9%), financial constraints (6.9%) and entrepreneurial skills (6.2%) of the farmers (Survey Diagrams; Figure 1.2).



2. Forage species and research

Figure 2.1, 2.2, 2.3. Question 4. "What are the three most common forage species used by dairy farmers in different farming system?" Based on the response in the questionnaire in the zero grazing system Napier grass (*Pennisetum purpureum*) Rhodes grass (*Chloris gayana*) and Maize (*Zea maize*) respectively 33.3%, 20.7% and 17.2% are the most commonly used forages. In the system with grazing on improved pastures Rhodes grass is the most used (33.3%) followed by star grass (*Cynodon dactylon*) and Kikuyu grass respectively 8.3% and 7.3%. In the Free range-Natural grassland system Kikuyu grass (*Pennisetum clandistinum*), Rhodes grass (*Chloris gayana*) and African foxtail grass (*Cenchrus ciliaris*) 31.9%, 14.9% and 14.9% are the most commented

Figure 2.1. Zero Grazing (Q4.1)

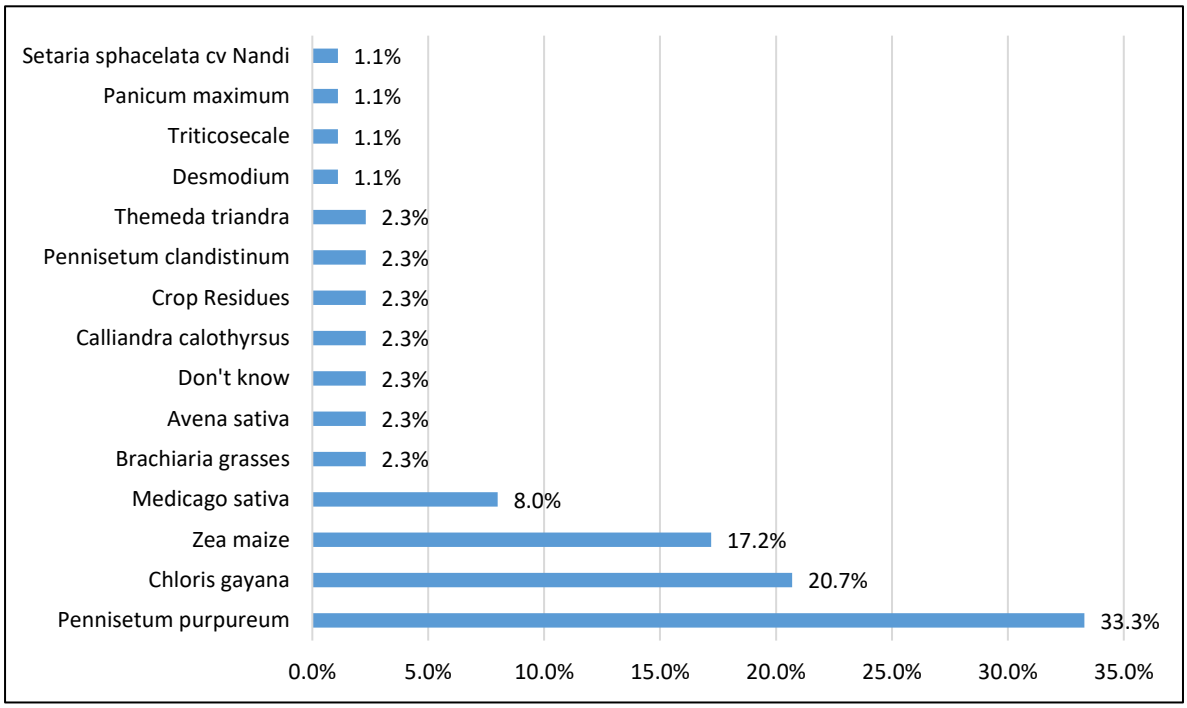


Figure 2.2. Grazing Improved Pastures (Q4.2)

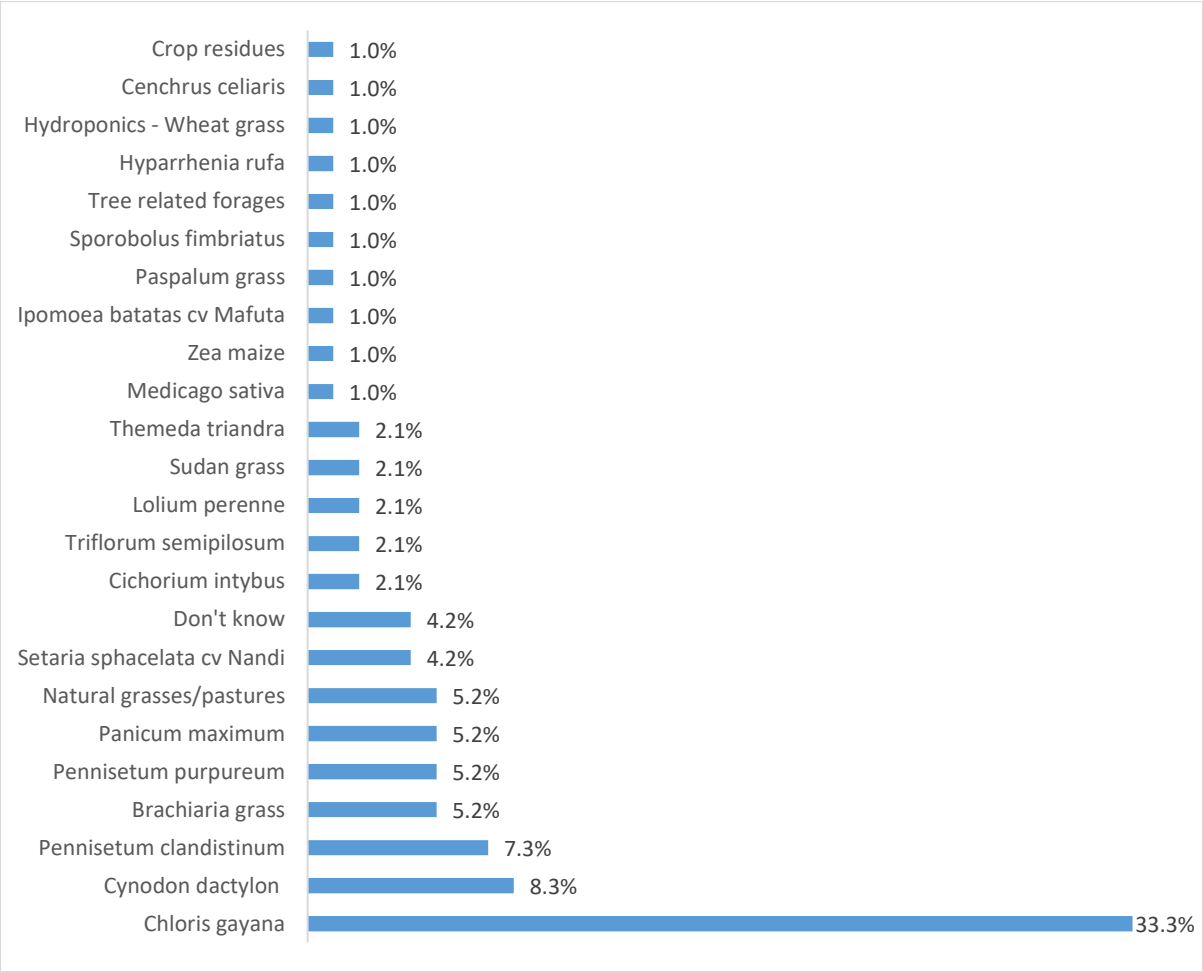


Figure 2.3. Free Range-Natural Grassland (Q4.3)

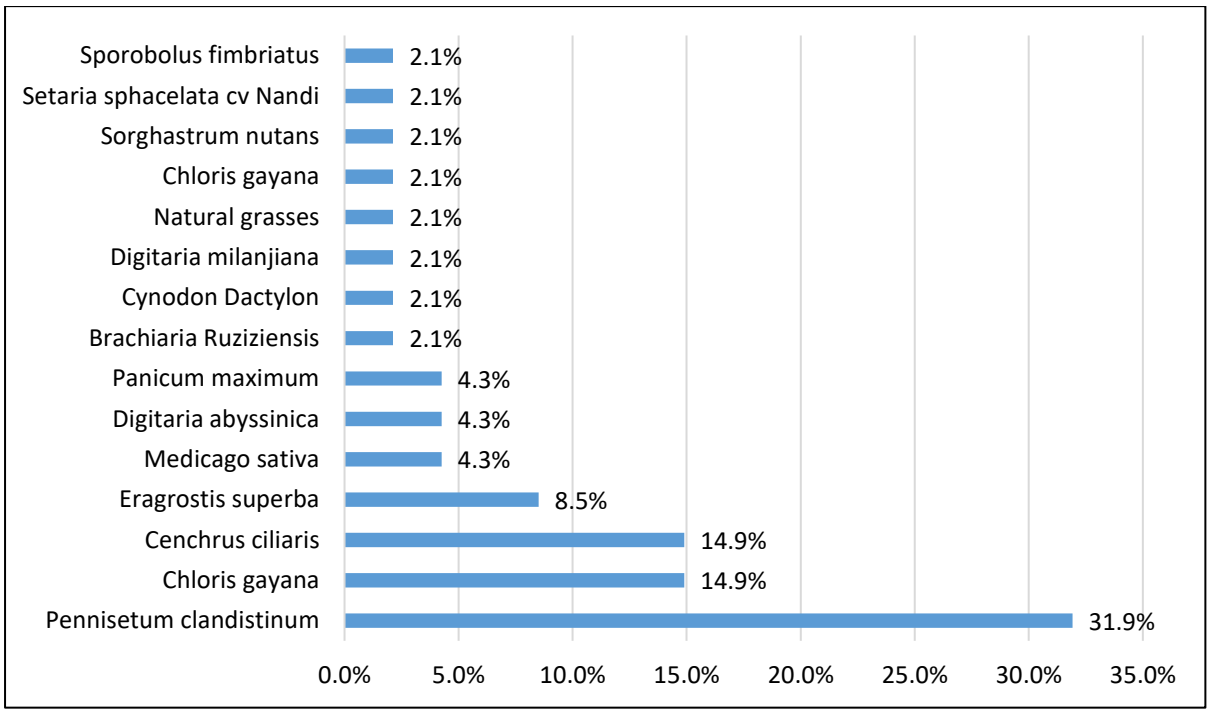


Figure 2.4, 2.5, 2.6, 2.7. Question 5. "Which forage species, in order of importance, do you think give the best return for the dairy farmer in the different farming systems?"

Based on the responses given to the questionnaire (Survey Diagrams; Figure 2.4) Maize (*Zea mays*) is gaining in popularity (17.2%) as a forage crop in zero grazing systems. It is easier to ensile than Napier grass. The maize varieties used are the same as those used for human consumption due to the absence of forage maize varieties in the local market. In zero grazing systems, responses to the questionnaire indicate that forage maize (26.7%) gives the best returns for the farmers, followed by Rhodes grass (16.3%) and Lucerne (15.1%). It is very likely that the respondents are referring to Rhodes hay and Lucerne hay bought in the forage markets. Only 7% of the respondents mentioned Napier grass as the forage species that gives the best returns (Survey Diagrams; Figure 2.4). This could be and indication that Napier grass is not used effectively, meaning it is used when it is overgrown and not at the optimum stage when nutritive values are high. Useful grasses such as giant setaria (*Setaria splendida*), giant panicum (*Panicum maximum*), Guatemala grass (*Tripsacum laxum*), Sudan grass (*Sorghum sudanense*), Columbus grass (*Sorghum almum*), oats (*Avena sativa*), are also mentioned in the response to the questionnaire.

Figure 2.4. Zero grazing (Q5.1).

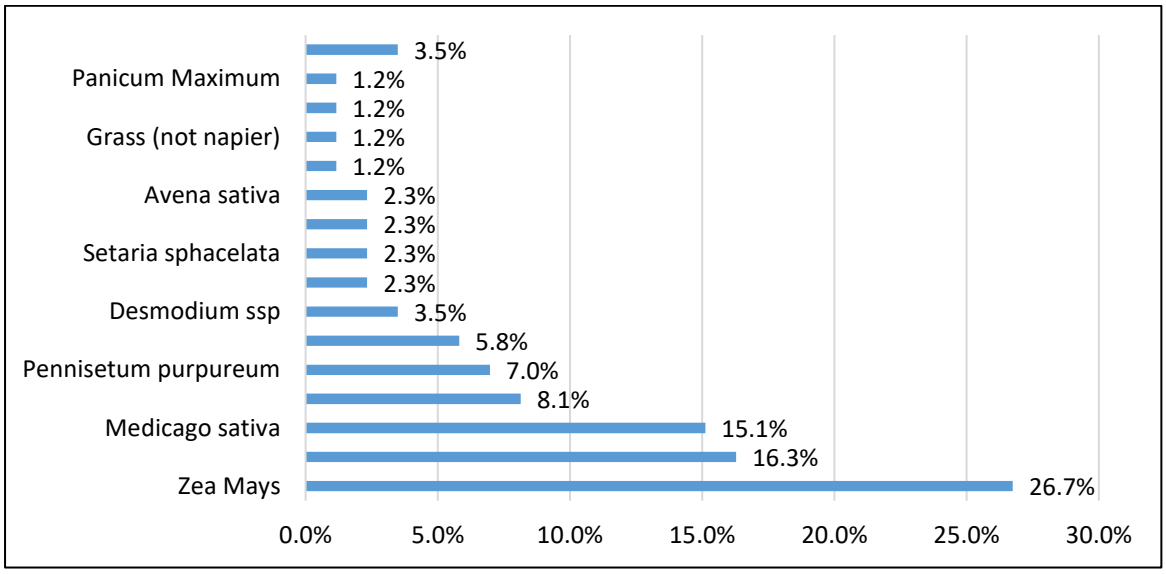


Figure 2.5. Grazing Improved Pastures (Q5.2).

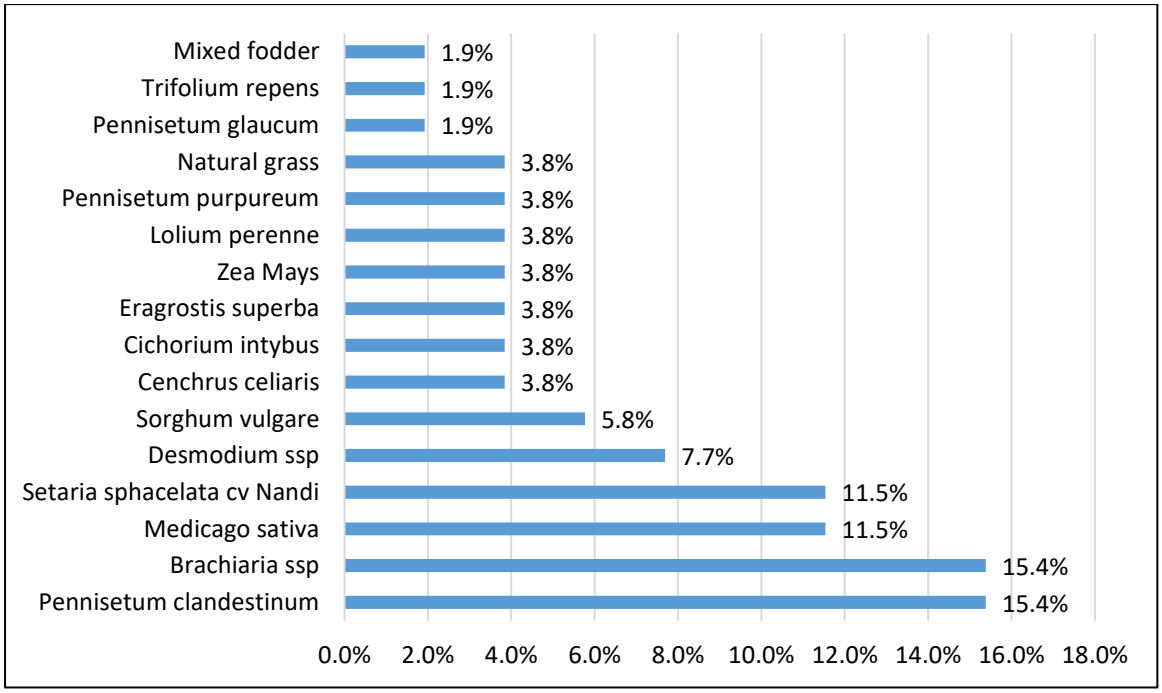


Figure 2.6. Free Range-Natural Grassland (Q5.3).

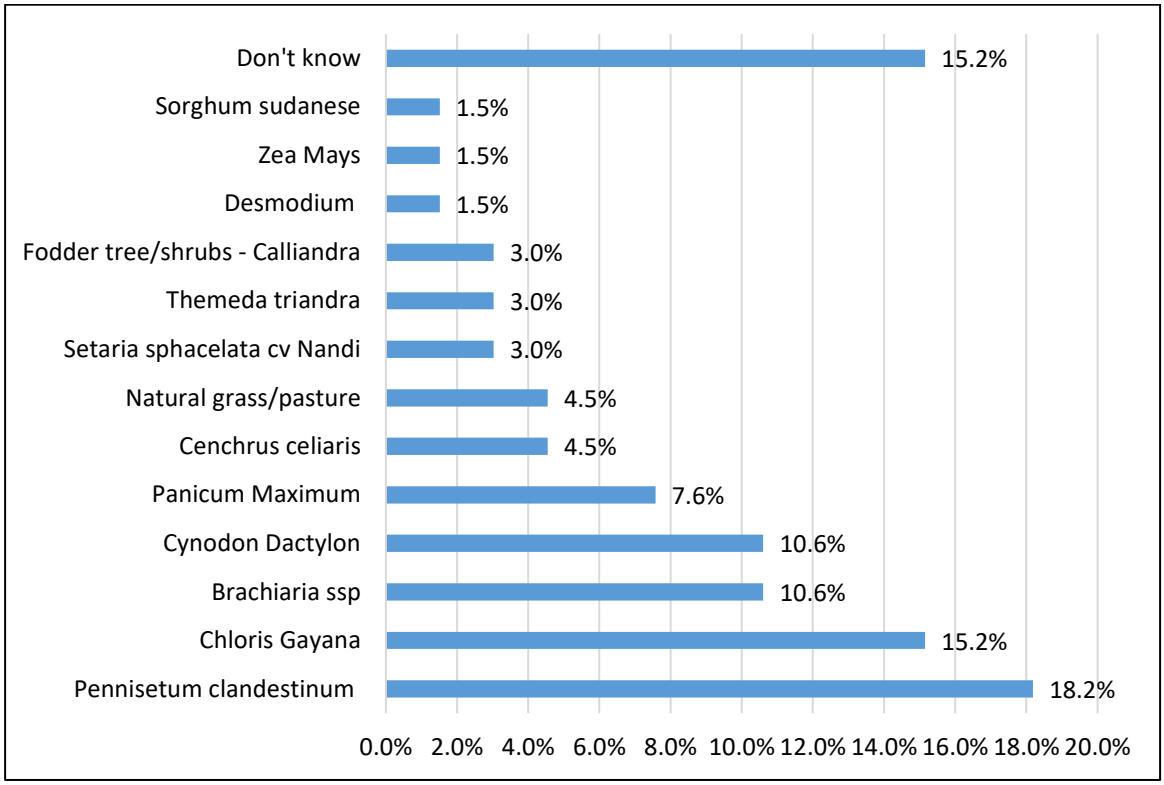


Figure 2.7. The 3 farming systems combined (Q 5.4).

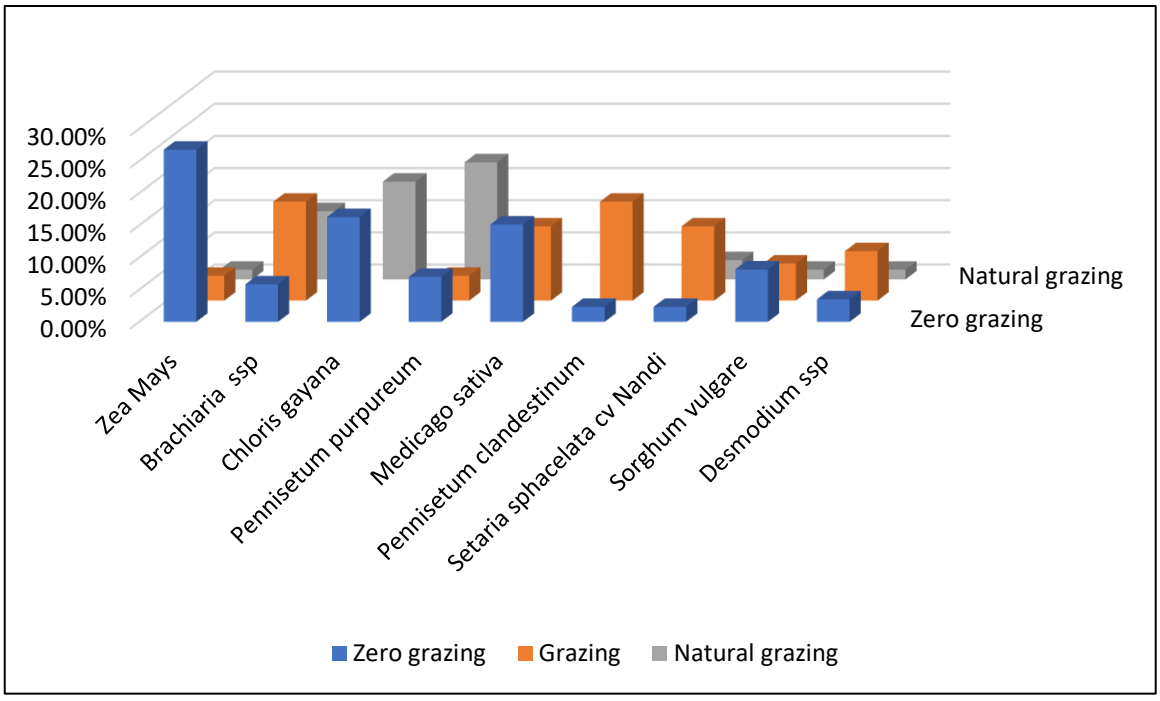


Figure 2.8, 2.9, 2.10, 2.11. Question 6. "What are the main constraints for forage production in the dairy farming systems and for commercial forage producers?"

In the zero grazing system, land availability (50% of the respondents) is seen as a major constraint for forage production in Kenya. Awareness, availability, affordability of and access to improved forage seeds is also perceived as a constraint (15.4%) (Survey Diagrams; Fig.2.8). In grazing and natural grassland production systems, land availability (16.7% and 12%) is still seen as a major constraint but there are other limitations playing an import role. In the grazing system, lack of water (15.4%), knowledge (15.4%), improved seeds (13.8%), and good pasture management practices (10.8%) are all considered to be constraints (Survey Diagrams; Figure 2.9, Figure 2.10). In the natural grassland system, climate change (20%) is mentioned as the major limitation, followed by poor management skills (12.7%) and organizational skills (12.7%) (Survey Diagrams; Figure 2.10). For commercial forage producers, according to the results of the questionnaire, the major constraint for forage production is seen as the need for appropriate machinery for the scale of the enterprise (23.2%) followed by availability of forage seeds (16.1%), and climate change (16.1%) (Survey Diagrams; Figure 2.11).

Fig.2.8. Zero Grazing (Q6.1).

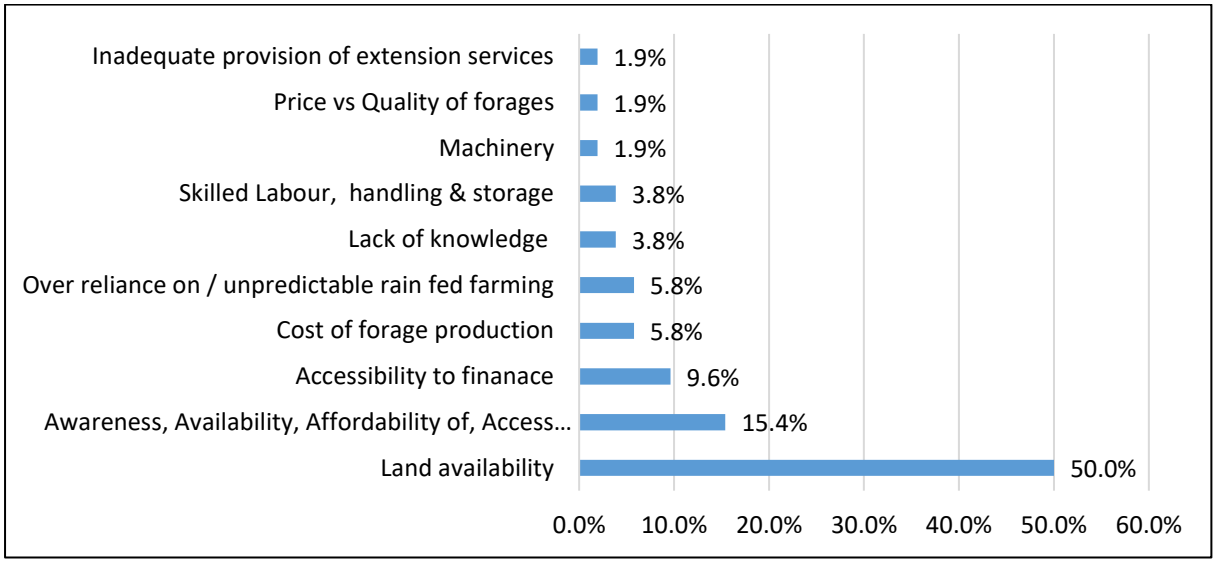


Figure 2.9. Grazing Improved Pastures (Q6.2).

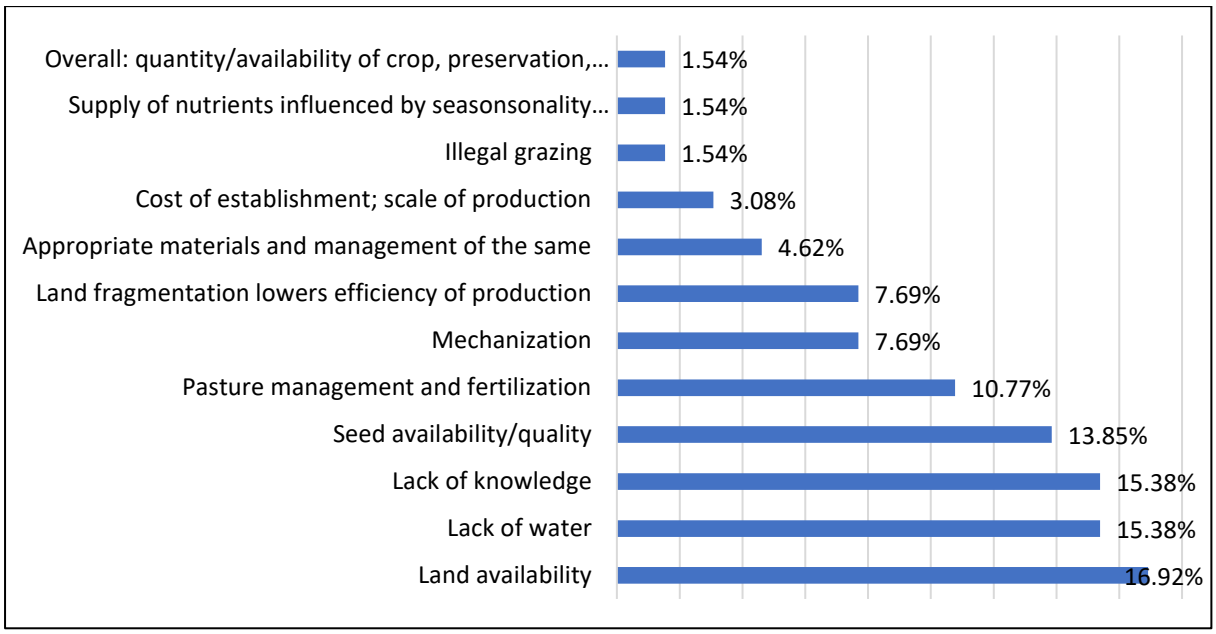


Figure 2.10. Free Range-Natural Grassland (Q6.3).

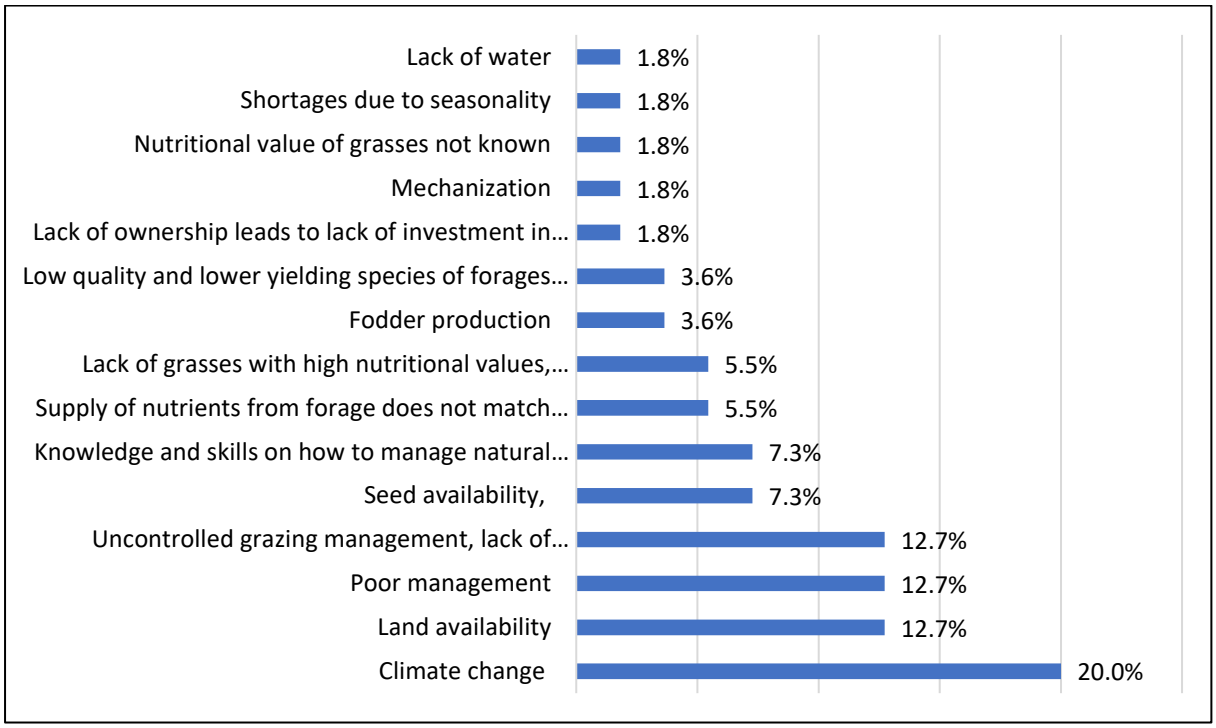


Figure 2.11. Commercial Forage Producers (Q6.4).

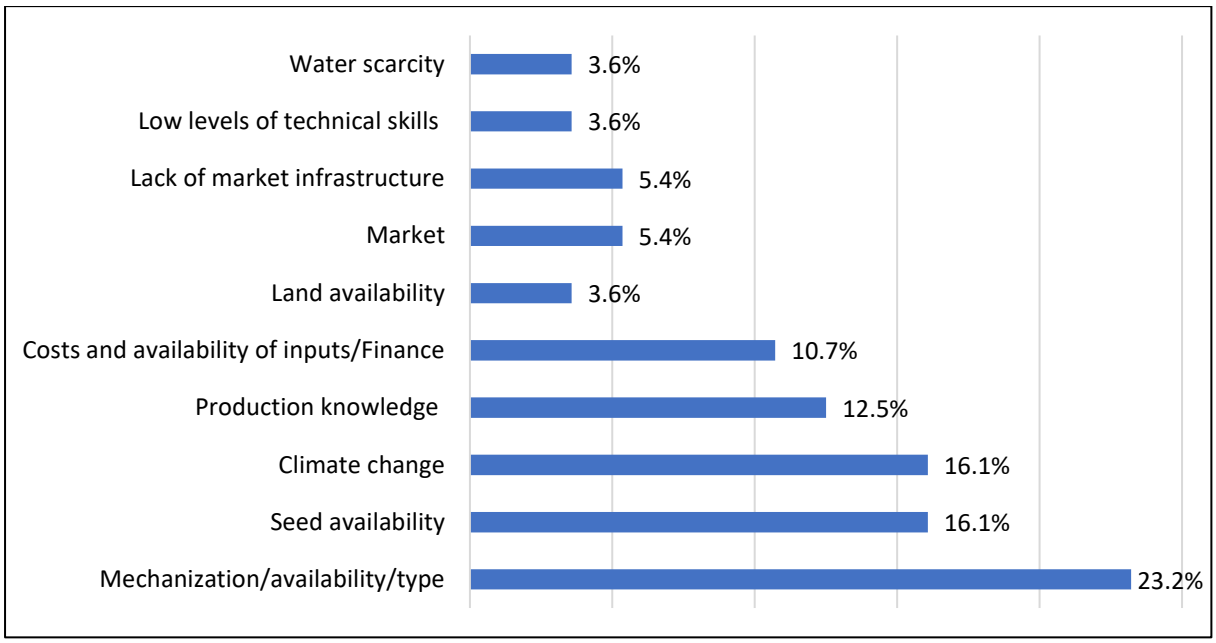


Figure 2.12, 2.13, 2.14, 2.15. Question 7. **" What new forage species (energy/protein rich) do you think can be introduced in the dairy farming systems?"** Figure 2.15 (Survey Diagrams) provides an overview of the three farming systems (zero grazing, semi-zero grazing, free grazing on natural grassland) and the species considered as promising by the respondents. The Figure shows that (i) *Brachiaria* is seen as the most promising forage crop in all three systems; (ii) Lucerne is also seen as a crop with potential in zero grazing as well as in (semi) grazing systems despite the often discouraging results obtained in practice.

Figure 2.12. Zero Grazing (Q7.1).

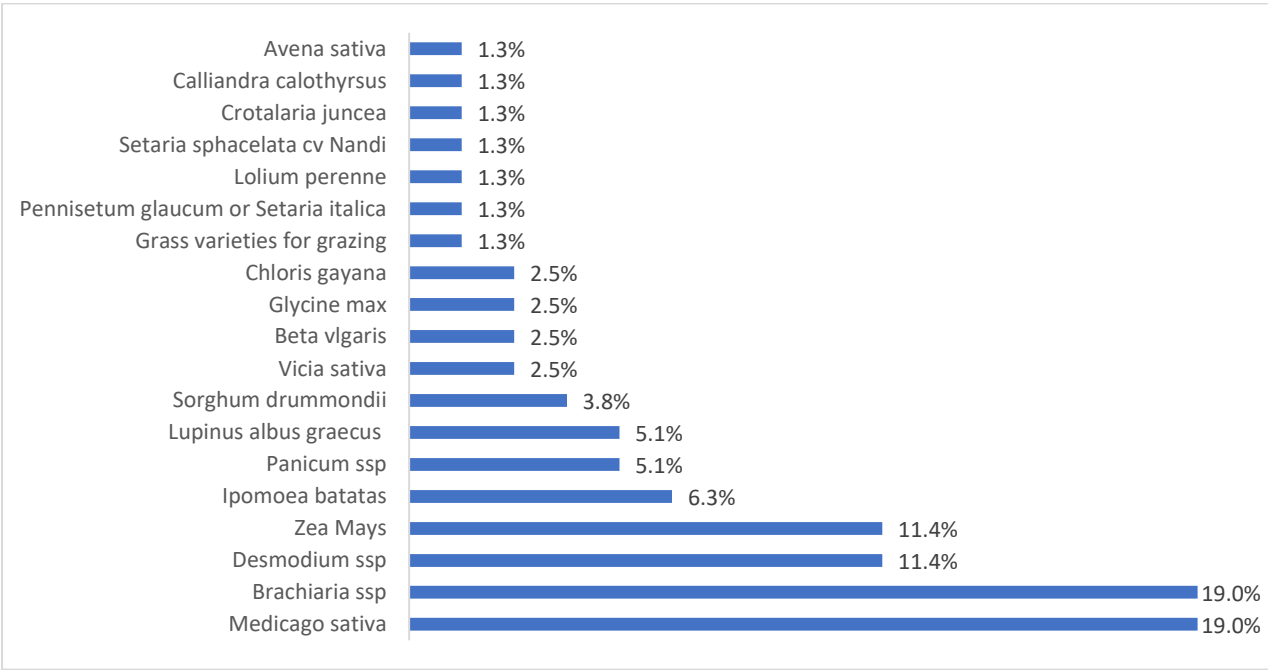


Figure 2.13. Grazing Improved Pastures (Q7.2).

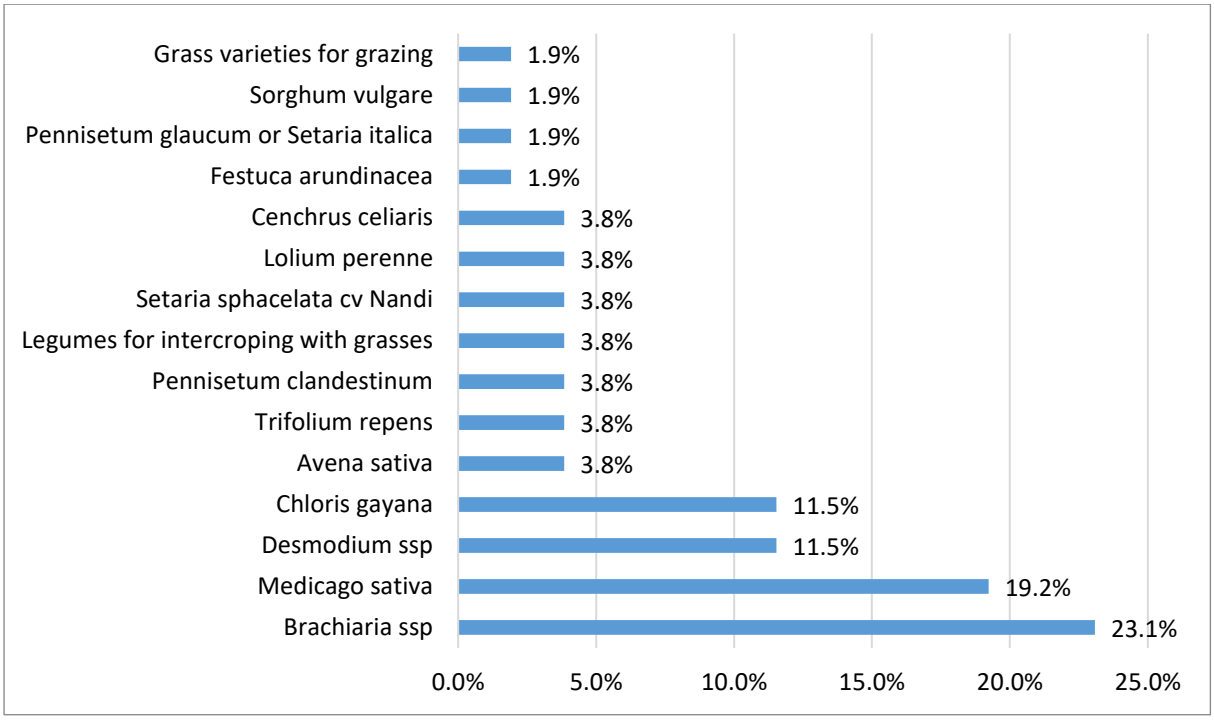


Figure 2.14. Free Range-Natural Grassland (Q7.3).

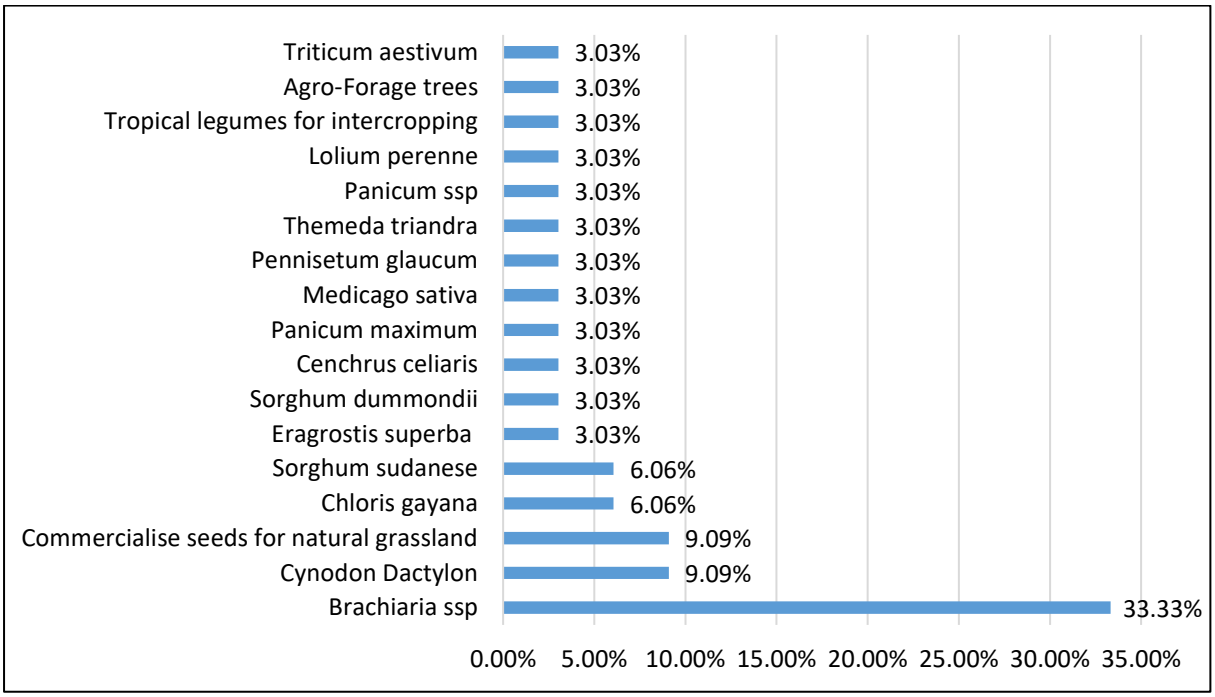
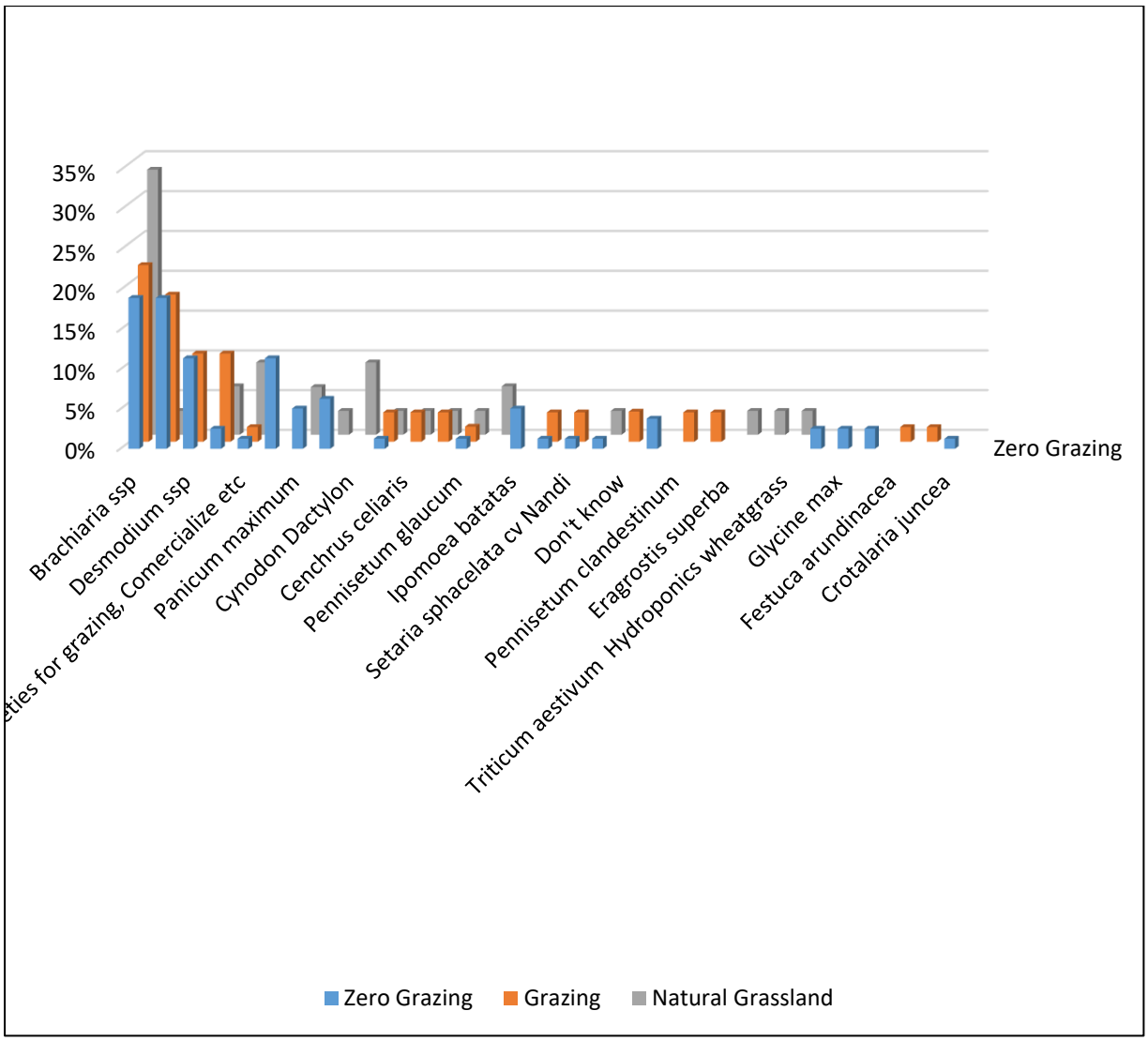


Figure 2.15. Overall of 3 farming systems (Q7.4).



5. Preservation of forage crops

Figure 5.1, 5.2, 5.3, 5.4. Question 8. "What are the three most common forage preservation methods used in the dairy farming systems and by commercial forage producers?" The response to the question shows that, overall, hay making is the most common way of forage preservation while ensiling is becoming increasingly important (Survey Diagrams, Figure 5.1, 5.2, 5.3, 5.4). The standing hay is used in grazing systems as an intervention to deal with periods of scarcity.

Figure 5.1. Zero Grazing (Q8.1)

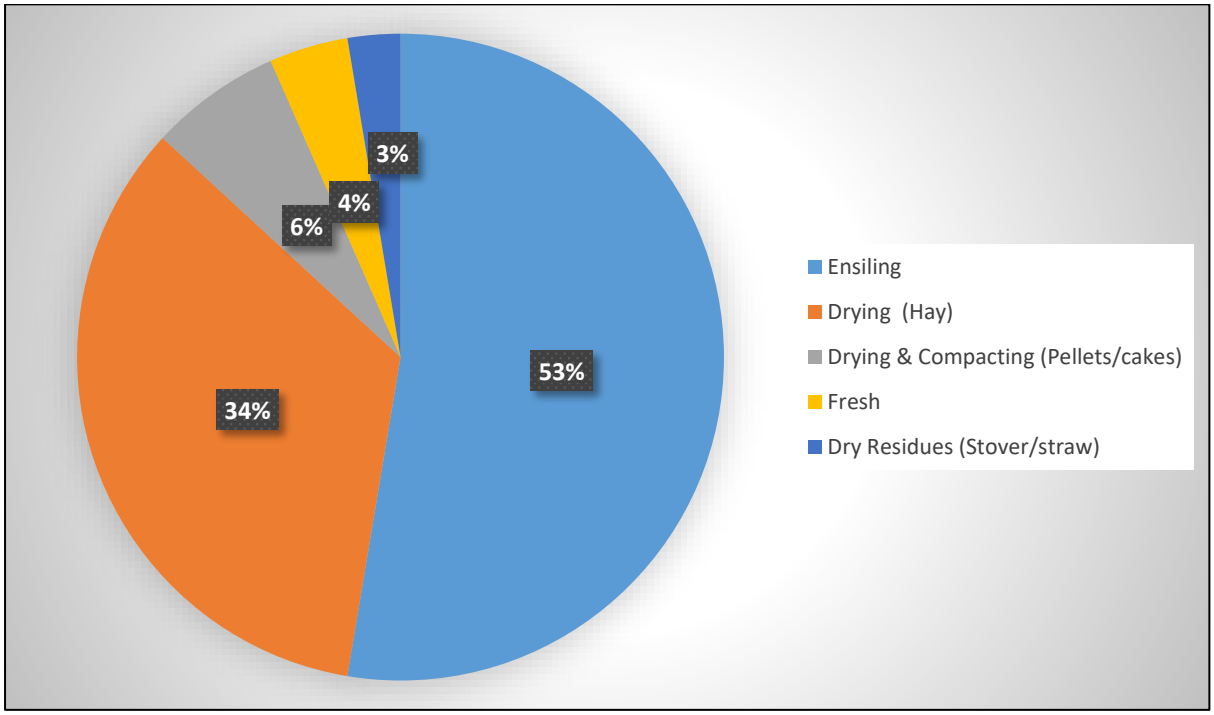


Figure 5.2. Grazing Improved Pastures (Q8.2)

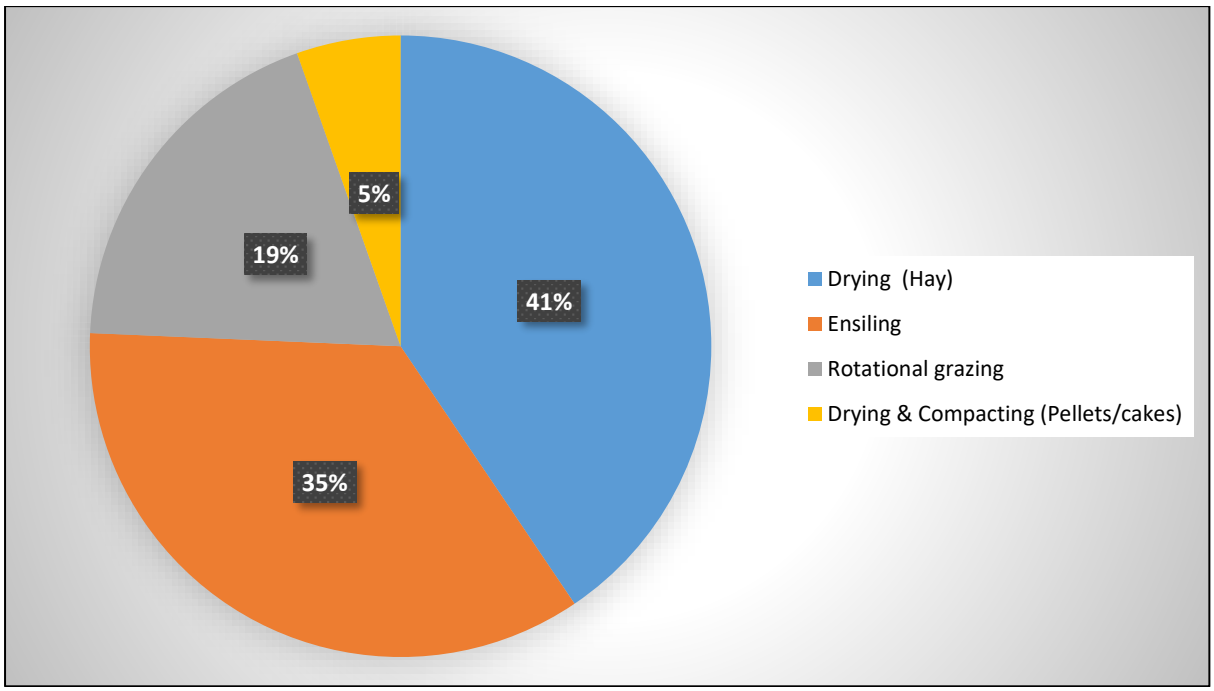


Figure 5.3. Free Range-Natural Grassland (Q8.3)

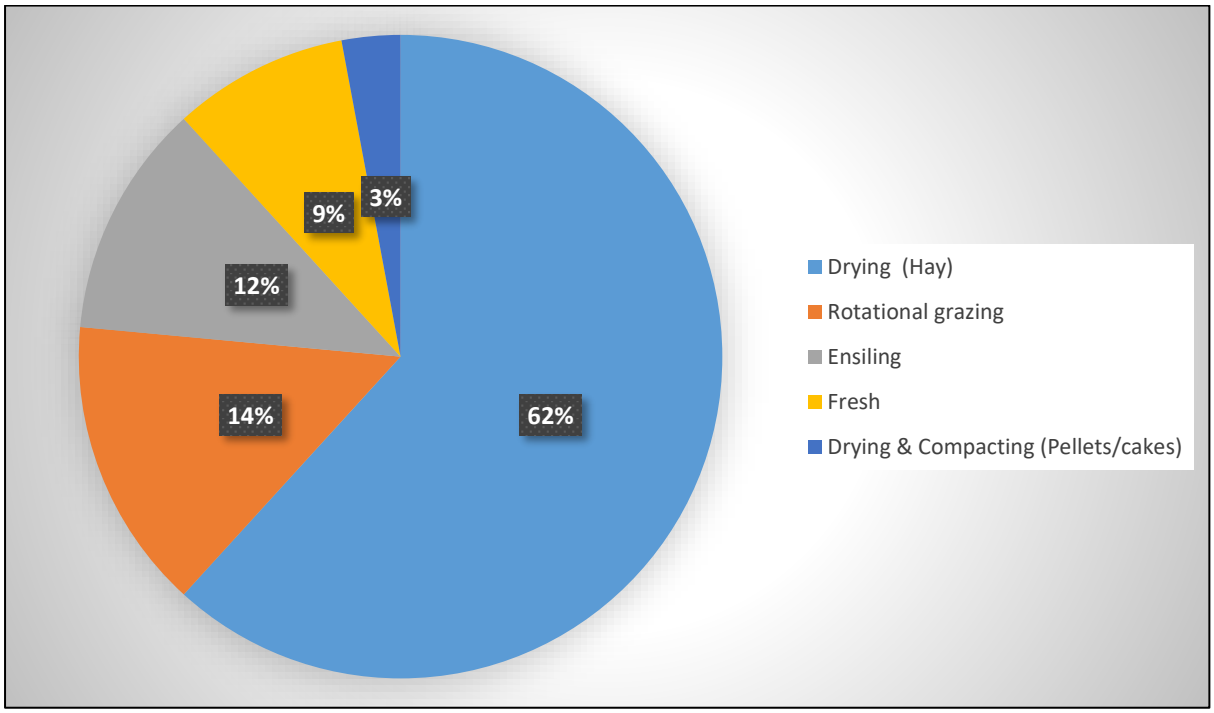


Figure 5.4. Commercial Forage Producers (Q8.4).

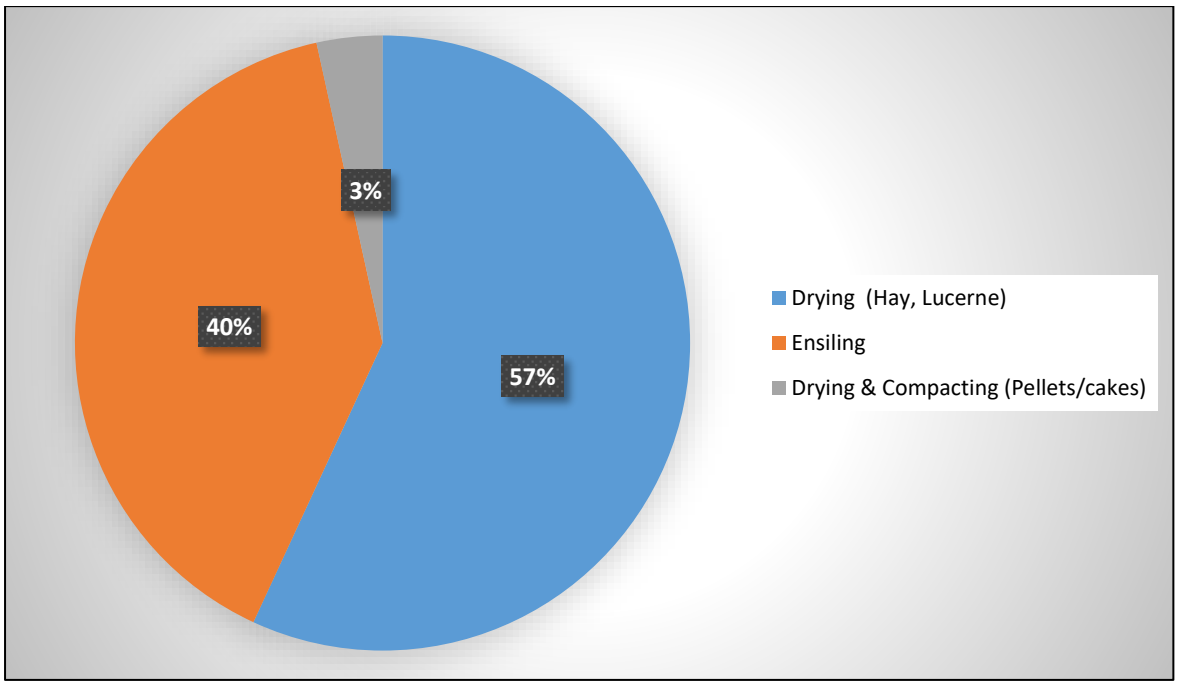


Figure 5.5. Question 9. "List at least three most common causes for post-harvest losses in the forage production and preservation chain?"

According to the respondents, poor agricultural practices during crop production causes the major post-harvest losses (34%), whereas poor storage of hay (dry place) (24.4%) and fermentation (11%) (Anaerobic conditions for silage) are the other important causes of losses (Survey Diagrams; Fig. 5.5).

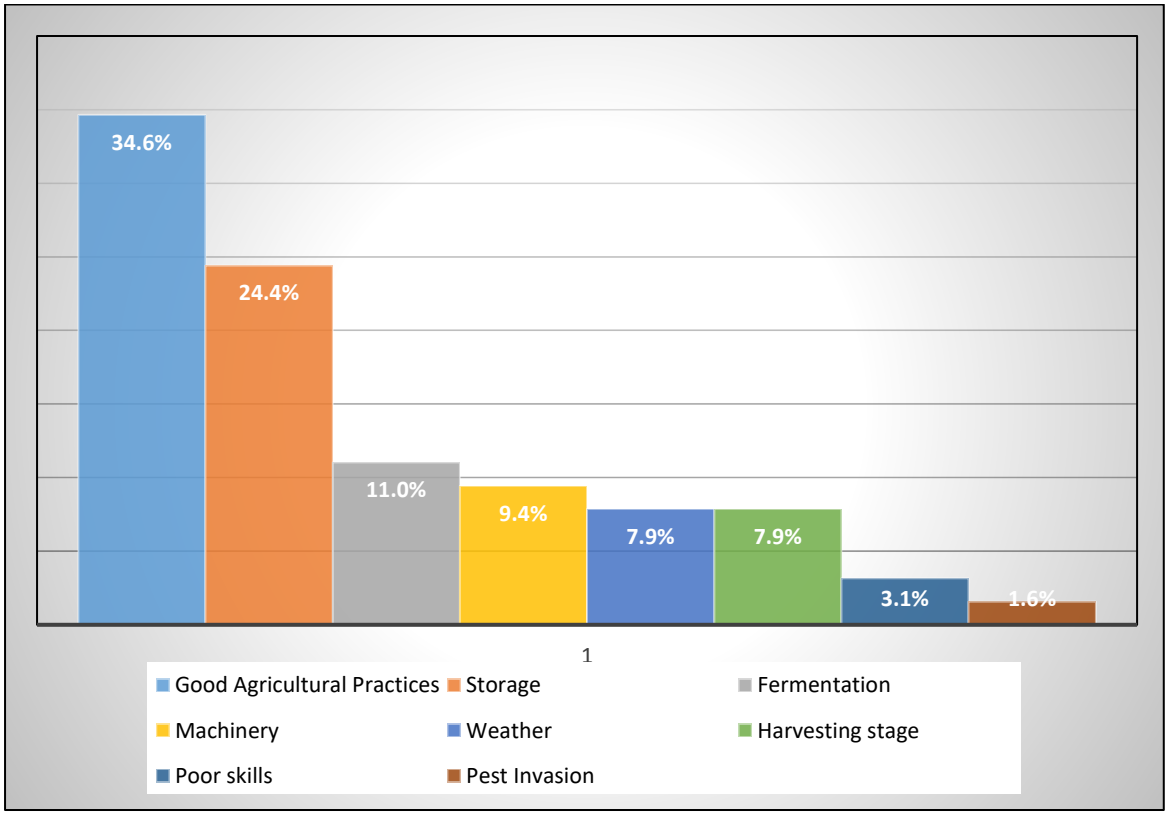


Figure 5.6. Question 10. "What farming practices can dairy farmers adopt to prevent or reduce harvest and post harvesting losses?"
The respondents rated applying good practices during crop management, harvest and storage (each 25%) as the key factors to reduce post-harvest losses (Survey Diagrams; Figure 5.6).

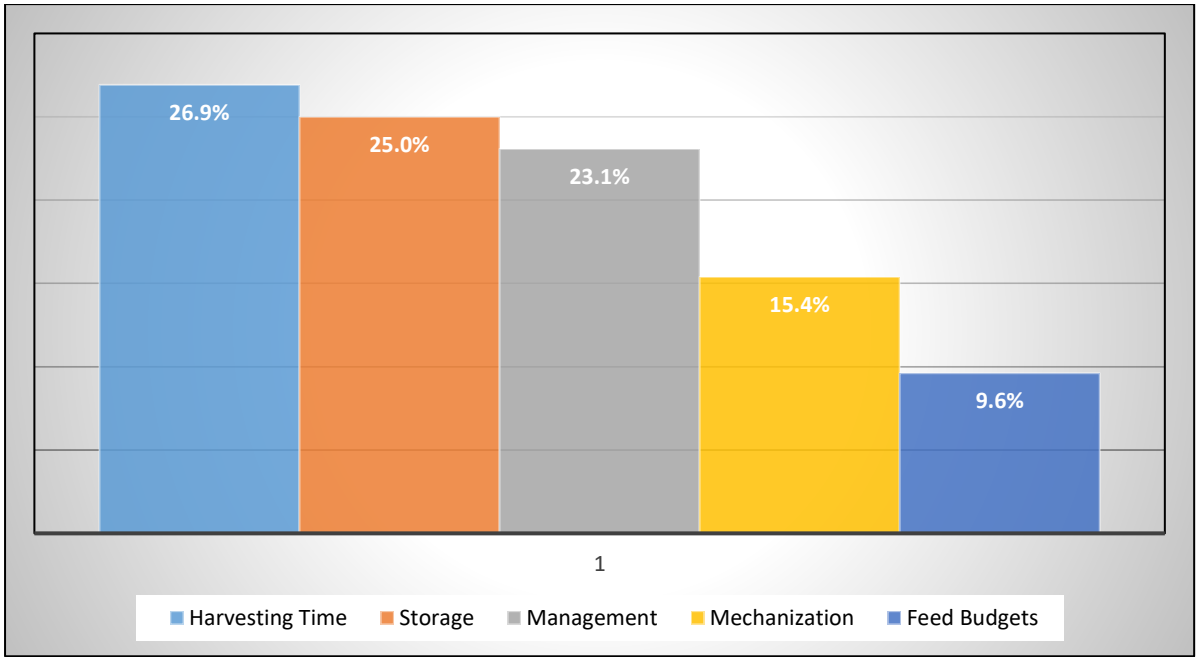


Figure 5.7, 5.8, 5.9, 5.10. Question 11. "Which other conservation methods or technologies do you think could be introduced in the current dairy farming systems?"
Silage making is particularly seen as a potential method to improve intensive farming systems (61.5%). For more extensive grazing systems, grass management is an important option (66.7% for natural grassland grazing and 27.3% for improved pasture grazing), except for cut-and-carry systems. For commercial forage producers, grass management (33.3%), use of improved species (24.2%), and hay (24.2%) are the preferred options (Survey Diagrams; Fig. 5.7-5.10).

Figure 5.7. Zero Grazing (Q11.1).

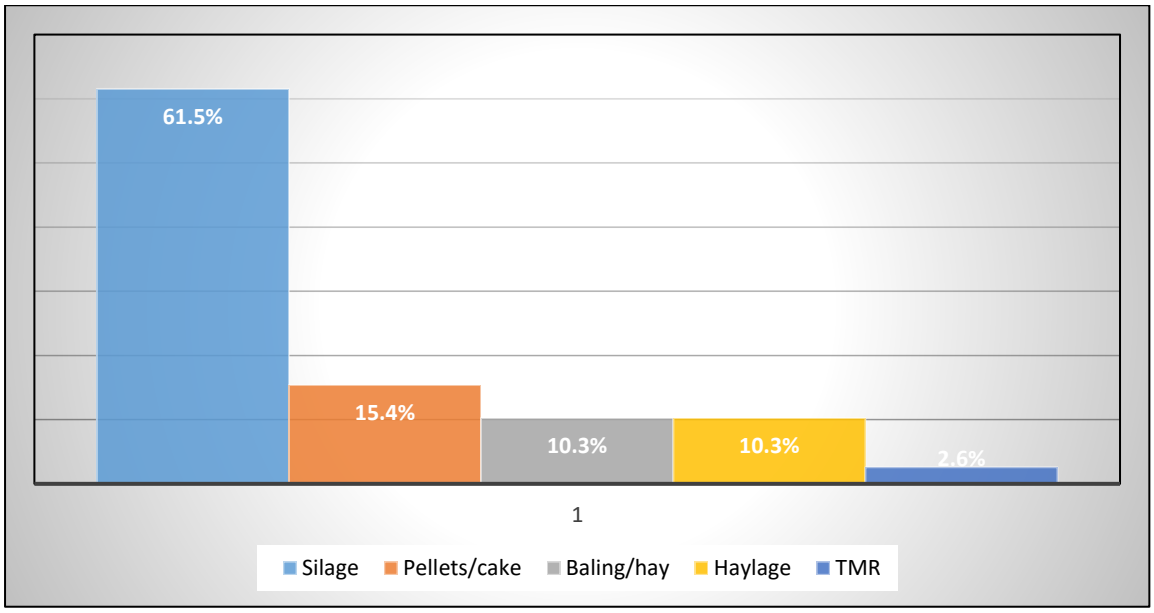


Figure 5.8. Grazing Improved Pastures (Q11.2).

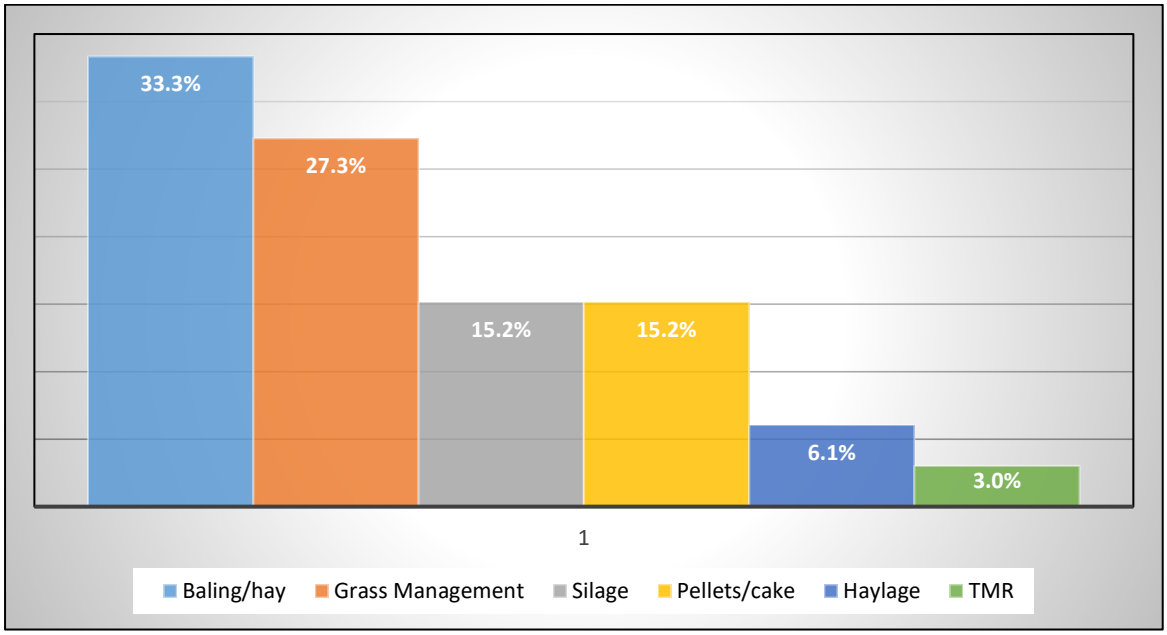


Figure 5.9. Free Range-Natural Grassland (Q11.3).

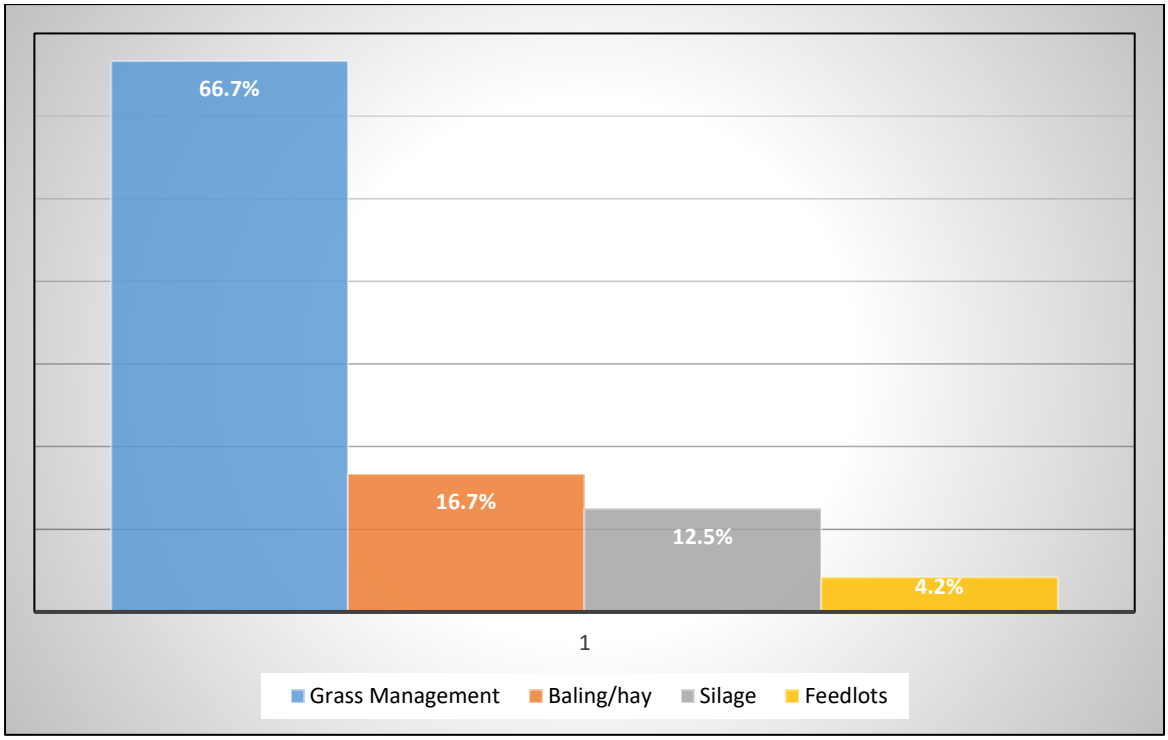


Figure 5.10. Commercial Forage Producers (Q11.4).

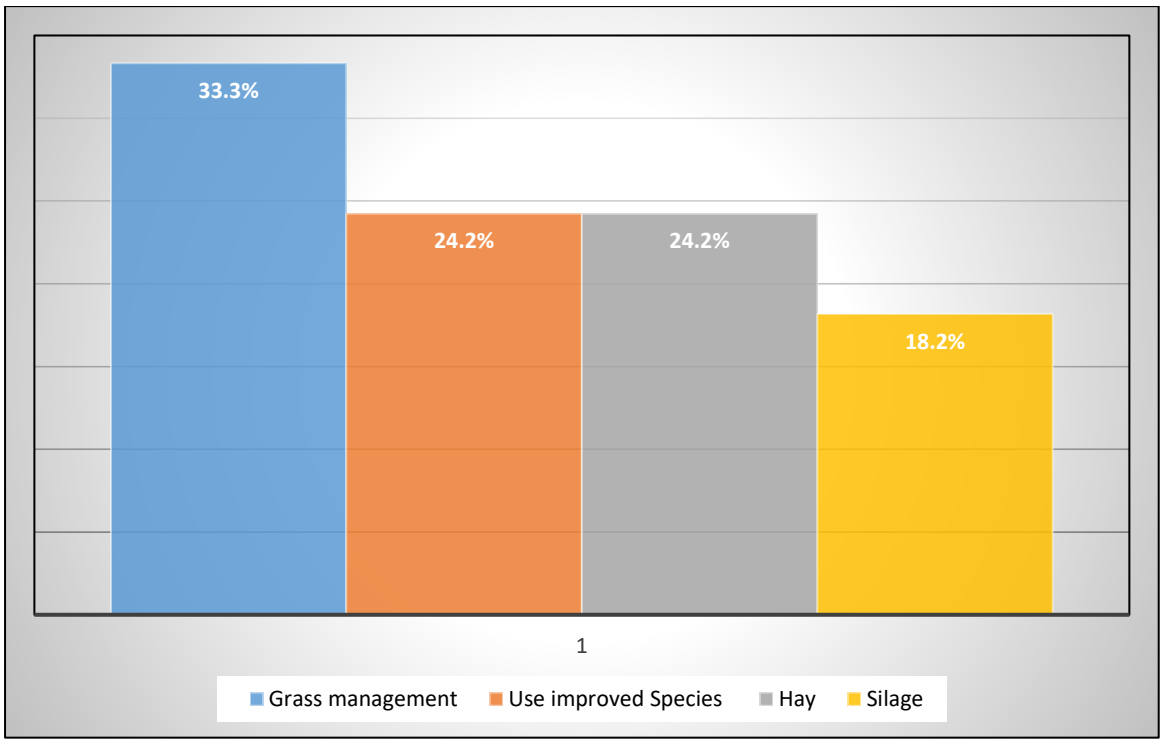


Figure 5.11, 5.12, 5.13. Question 12. "Which forage crops and preservation technologies are best suited to reduce the problem of seasonality?"

In zero grazing systems, maize silage is the preferred option (40.7%), followed by silage from other forage species (37%). In extensive grazing systems, hay (31.8%) and improved grass species (29.7%) and silage (22.7%) are considered the best suited preservation options to reduce the problem of seasonality. In free range systems, grass management (33.3%) is considered as the most important tool to cope with forage shortage during the dry season, followed by improved species and hay (24.2% each) (Survey Diagrams; Fig. 5.11, 5.12, 5.13).

Figure 5.11. Zero grazing (Q12.1)

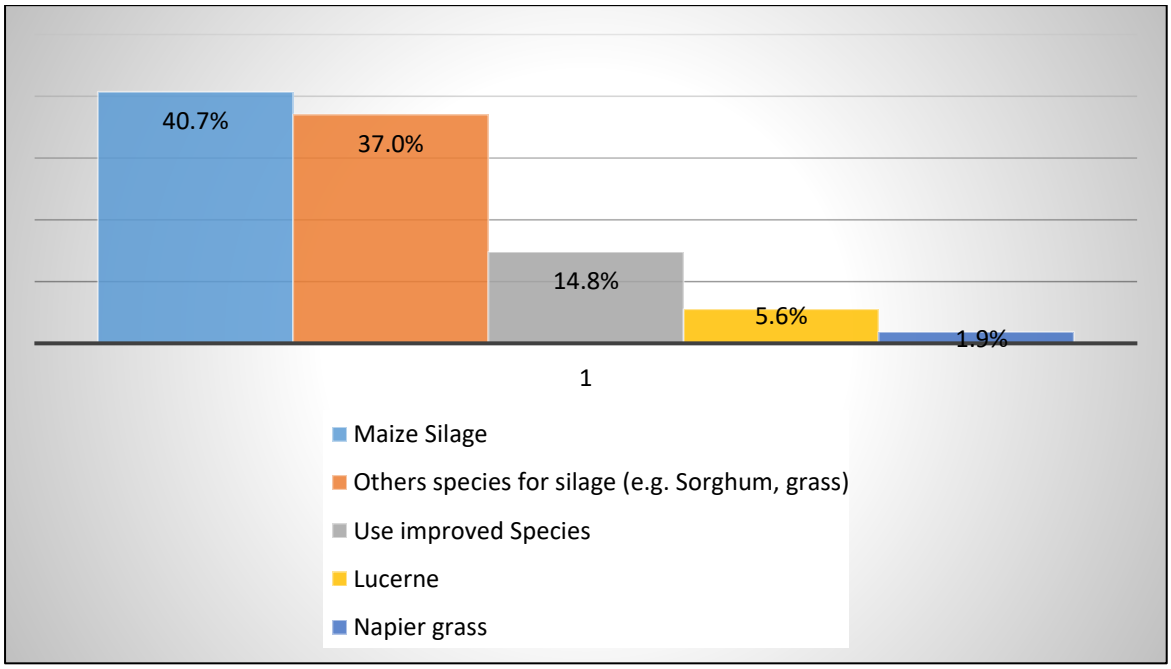


Figure 5.12. Grazing Improved Pastures (Q12.2).

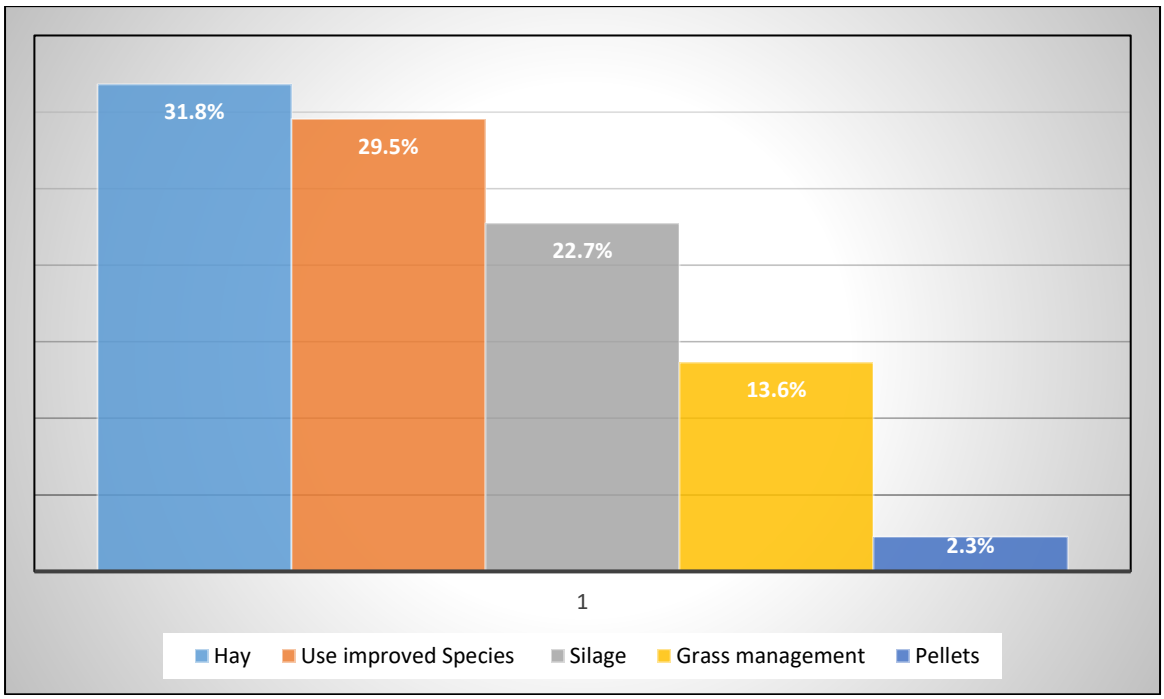


Figure 5.13. Free Range-Natural Grassland (Q12.3).

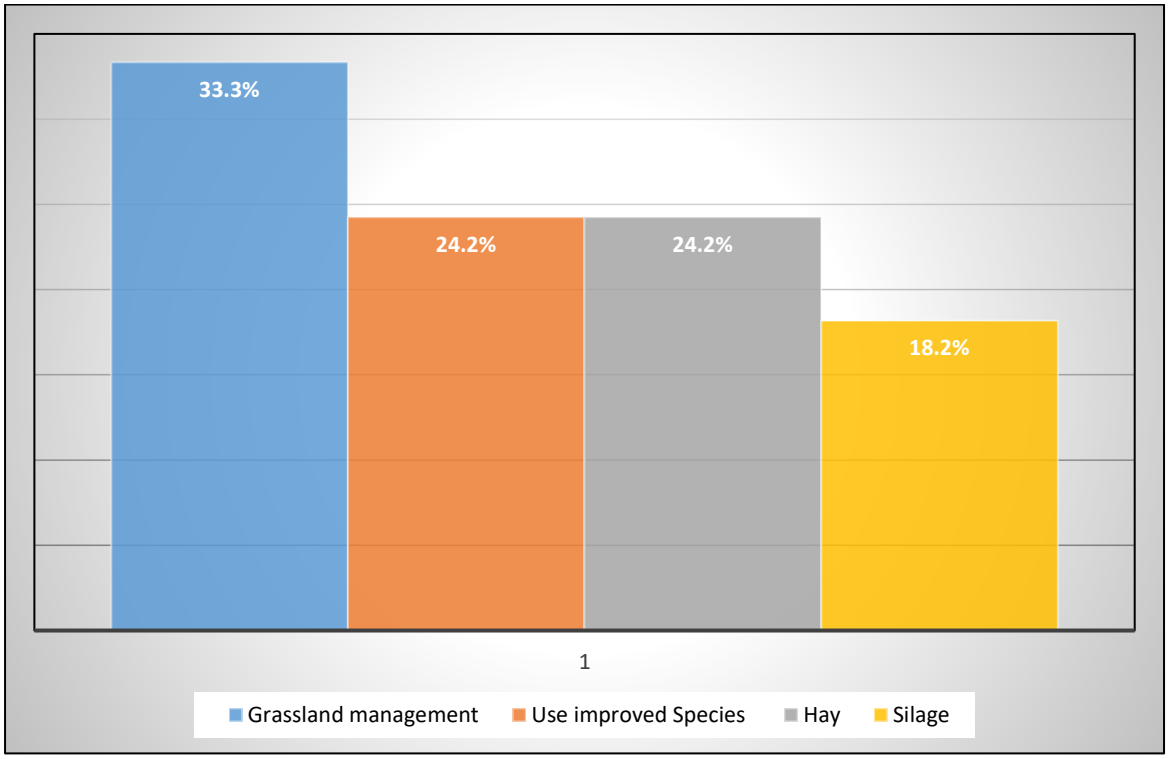


Figure 5.14. Question 13." Where do you think commercial forage production will be developed in the future?"
The respondents indicated that forage production is likely to develop in the midlands (18.75%) and highlands (15.25%). The semi-arid lands were seen as less favorable for forage crops (11.1%). In the urban and peri urban areas, commercial forage production is not expected to develop in the future due to the land pressure in these areas (Survey Diagrams; Figure 5.14).

Figure 5.14. Future development of commercial fodder production (Q13).

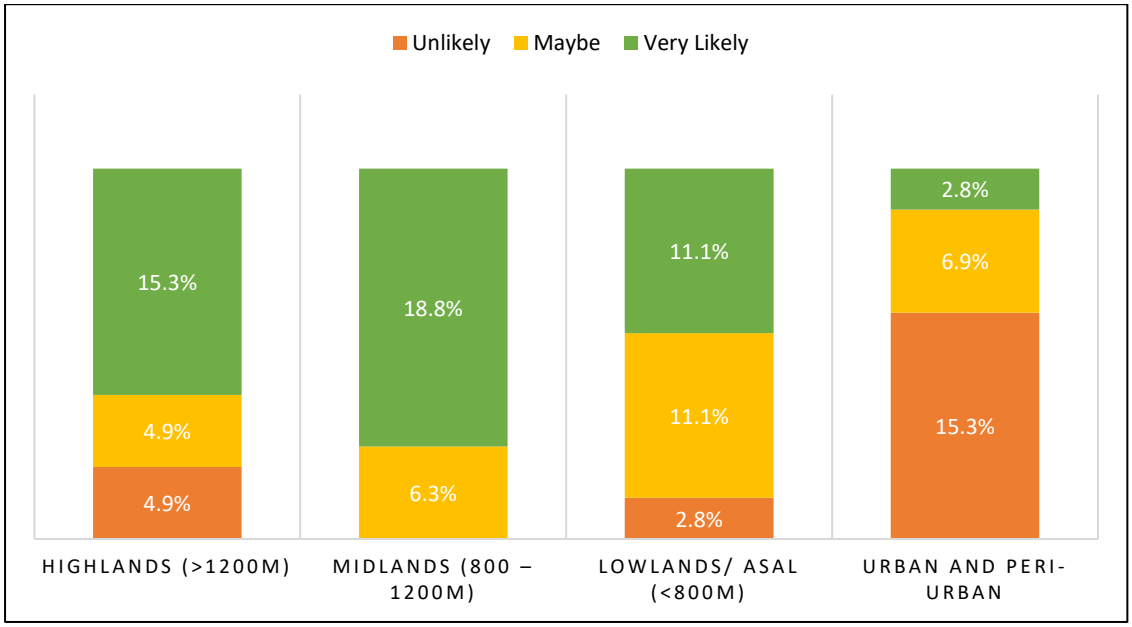


Figure 5.15. Question 14. "Where do you think commercial milk production will be developed in the future?"
The respondents indicated that in all areas, from highlands to lowlands, and in the urban and peri-urban areas, commercial milk production will continue to grow or develop in the future (Survey Diagrams; Figure 5.15).

Figure 5.15. Future development of commercial milk production (Q14)

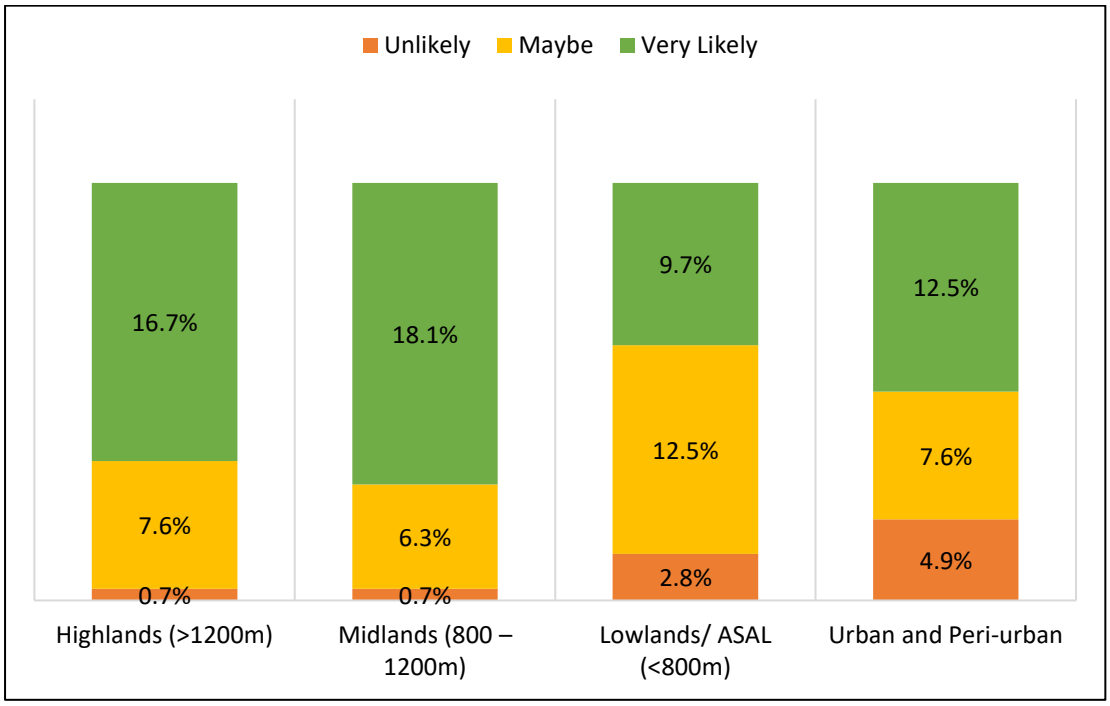
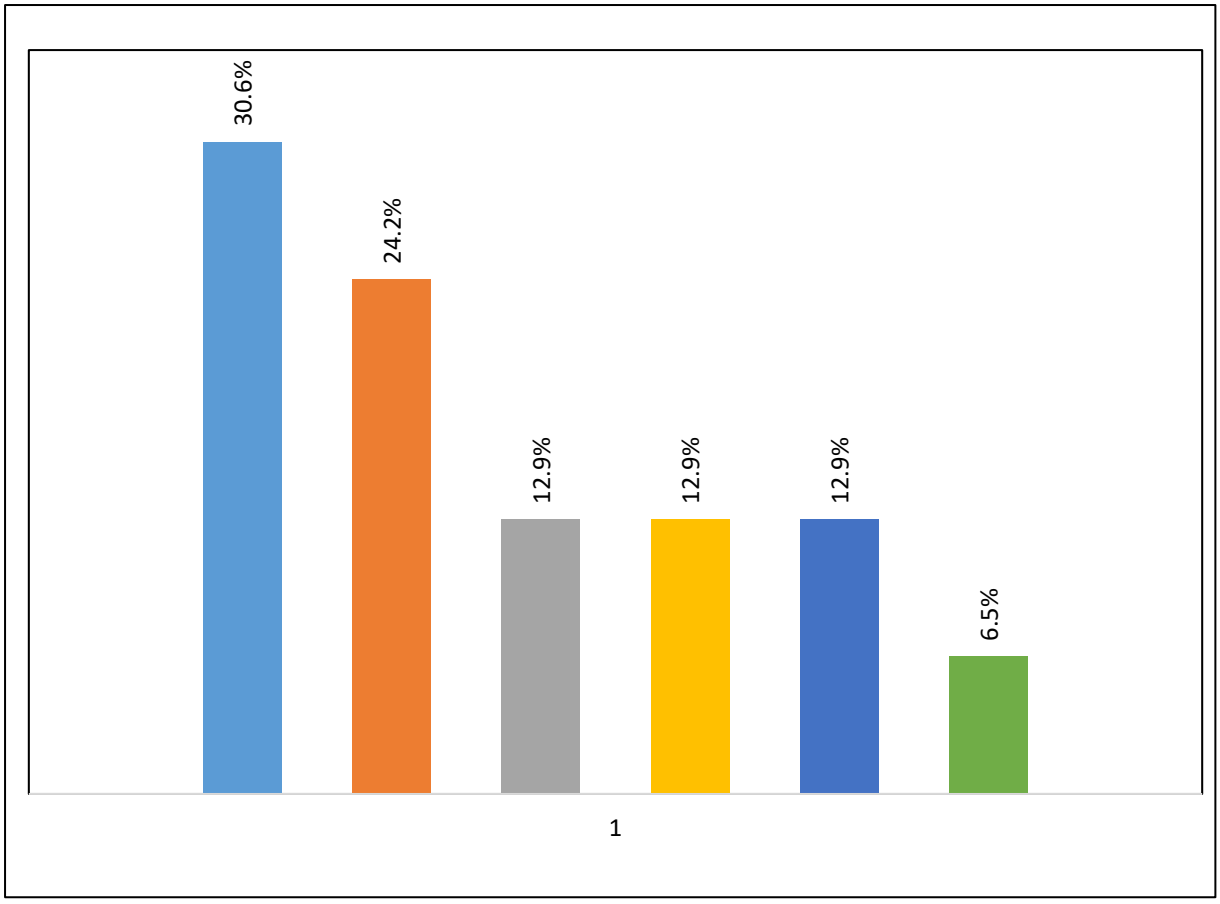


Figure 5.16. Question 15 "Which measures need to be taken - at various levels e.g. farm, policy, seed supply, mechanisation - to improve the quality or forages?"
The most important measure mentioned to improve the quality of forages was the quality and supply of forage seeds (access, availability) (30.6%). Enhancement of mechanisation from seed to feed (24%) was also raised as a measure to improve forage quality (Survey Diagrams; Figure 5.16).

Figure 5.16. Which measures need to be taken to improve the quality of forages (Q15)



6. Seeds, planting material and fertilizer use.

Figure 6.1. Question 16. "In your opinion, what is the availability of the listed seeds/plant material in the market? "
The respondents of the questionnaire have a general low opinion about the availability of forage seeds varieties. The planting material/seeds most easily accessible are Napier grass (planting material), Rhodes grass (seeds) and maize varieties. These are wrongly perceived as "forage" maize, as all maize varieties in Kenya are specifically bred for grain production (Survey Diagrams; Figure 6.1). Availability of forage crops seeds is low (56%), with only 12% of the respondents mentioning forage crop seeds/planting material being easily available and accessible.

Figure 6.1. In your opinion,what is the availability of the listed seeds/plant material in the market (Q16)

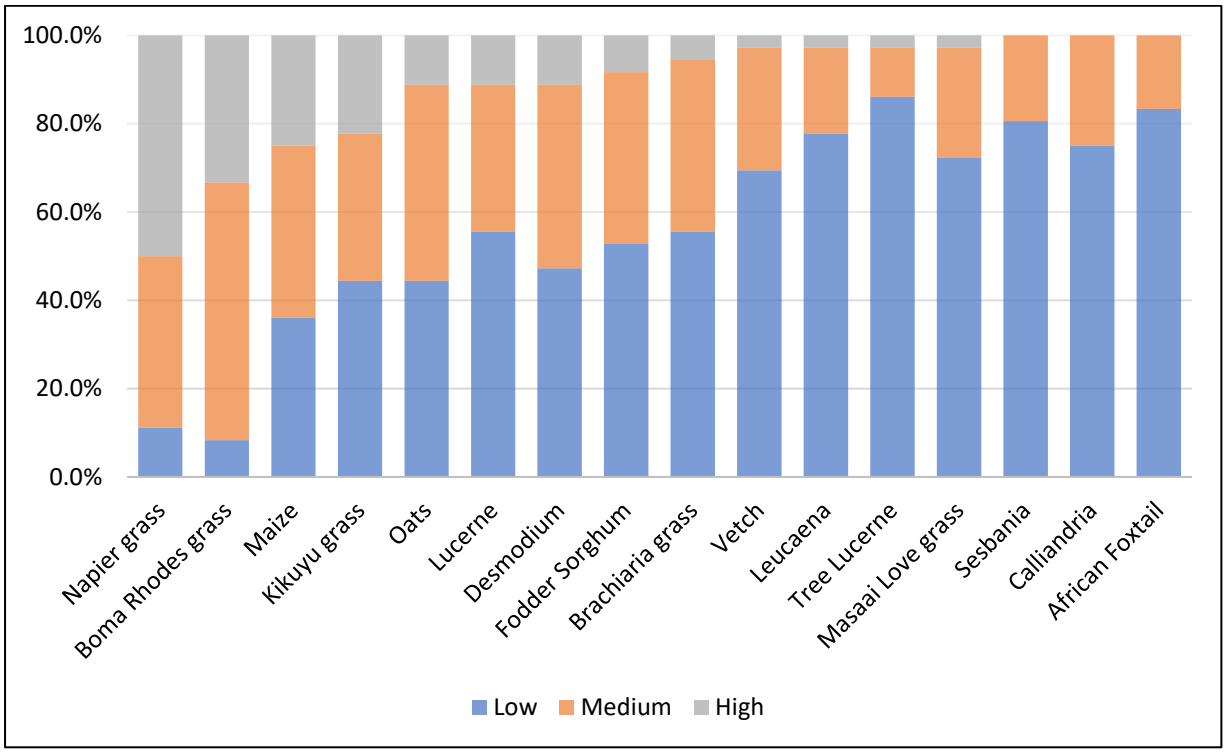


Figure 6.2. Question 17." What are reasons for low availability of seeds in the market (incl. new varieties or species not yet registered in Kenya)?"

The reasons the respondents of the questionnaire gave for the low availability of seeds are (i) unfavorable government policies/regulations (34%), (ii) knowledge-gap on the relation between the agronomy of forage crops and animal requirements (26%), and (iii) low availability and access to the seeds and plant material due to lack of distribution network and marketing efforts (Survey Diagrams; Figure 6.2).

Figure 6.2. What are the reasons for low availability of seeds in the market (Q17)

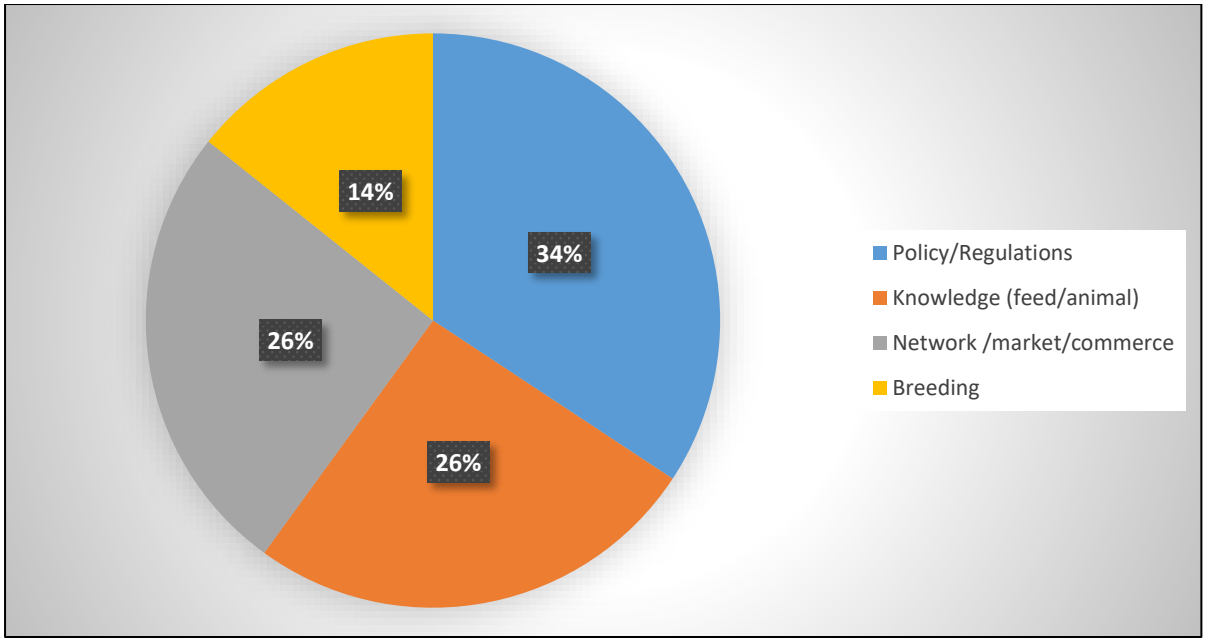


Figure 6.3. Question 18." How would you increase the availability of seed/plant material?"
Based on the survey, the most needed action is (i) changing the government policies and regulations on forage seeds and planting material, e.g. simplify the importation, testing and registration processes (39%), (ii) the increase in the availability of seed and plant material, and (iii) encouragement of international seed producers to enter the Kenyan market with forage seeds (Survey Diagrams 2; Figure 6.3).

Figure 6.3. How would you increase the availability of seed/plant material (Q18)

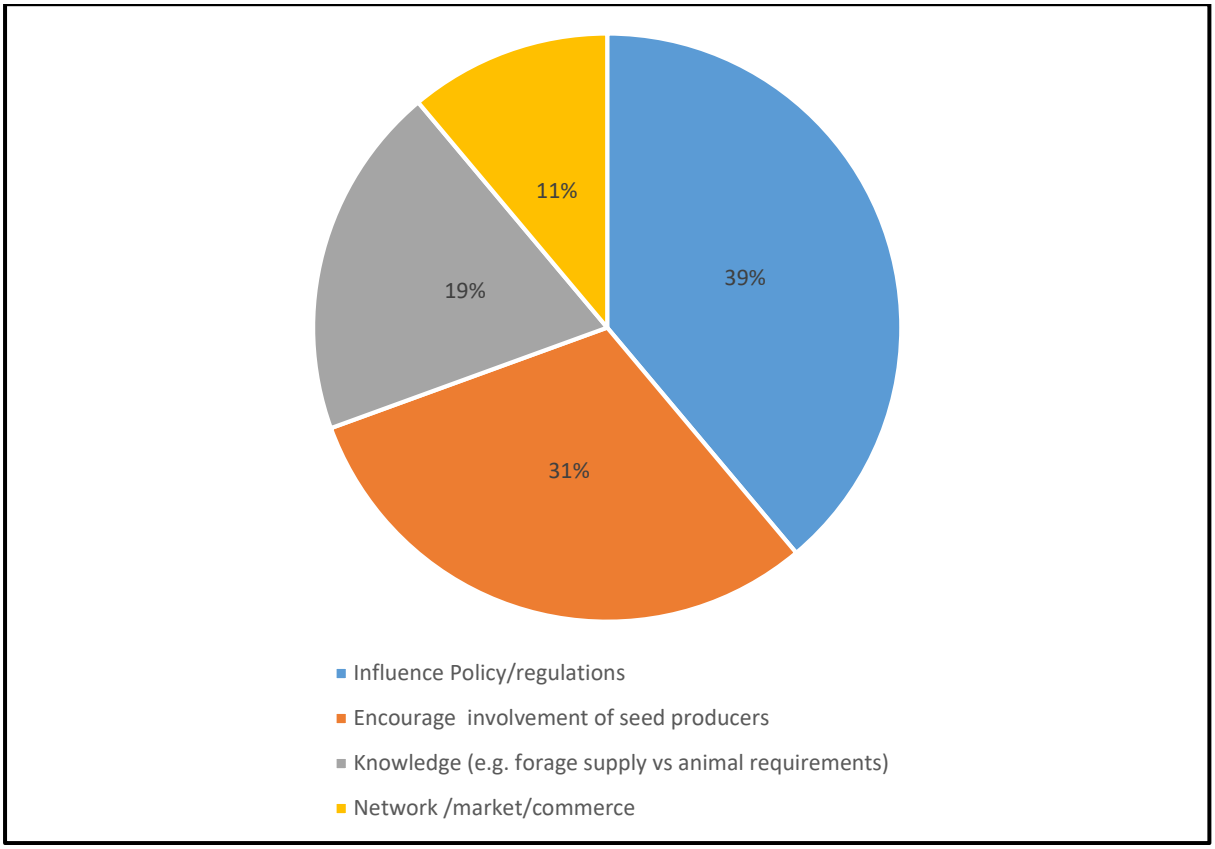


Figure 6.4, Question 19. "How would you engage dairy farmers to use improved forage seeds/plant material for planting?"

To encourage farmers to use the improved forage seeds in the future, respondents agreed that training of farmers in all farming systems (> 72%) will be necessary to reap the benefits of improved seeds/plant material (97%) (Survey Diagrams; Figure 6.4).

Figure 6.4. How would you engage dairy farmers to useimproved forage seeds/plant material for planting (Q19)

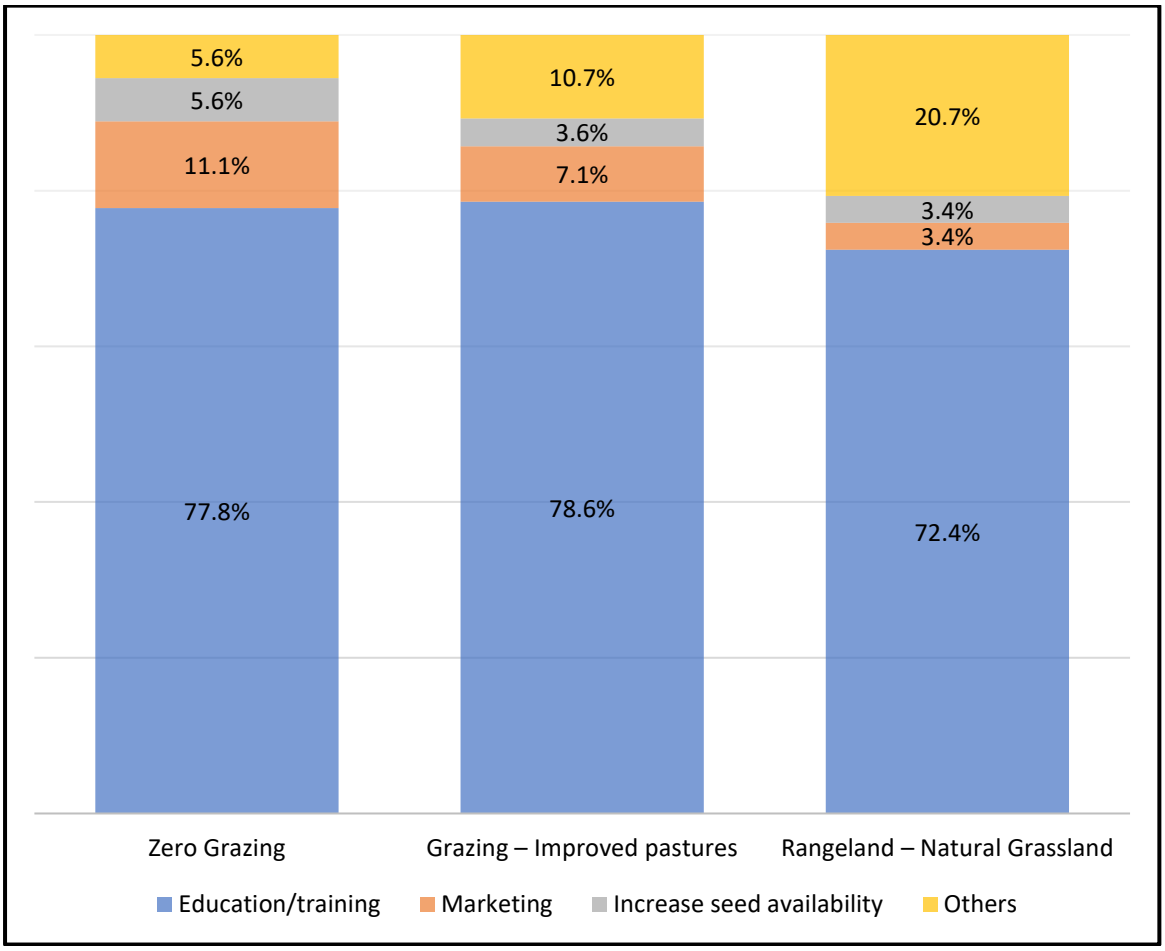
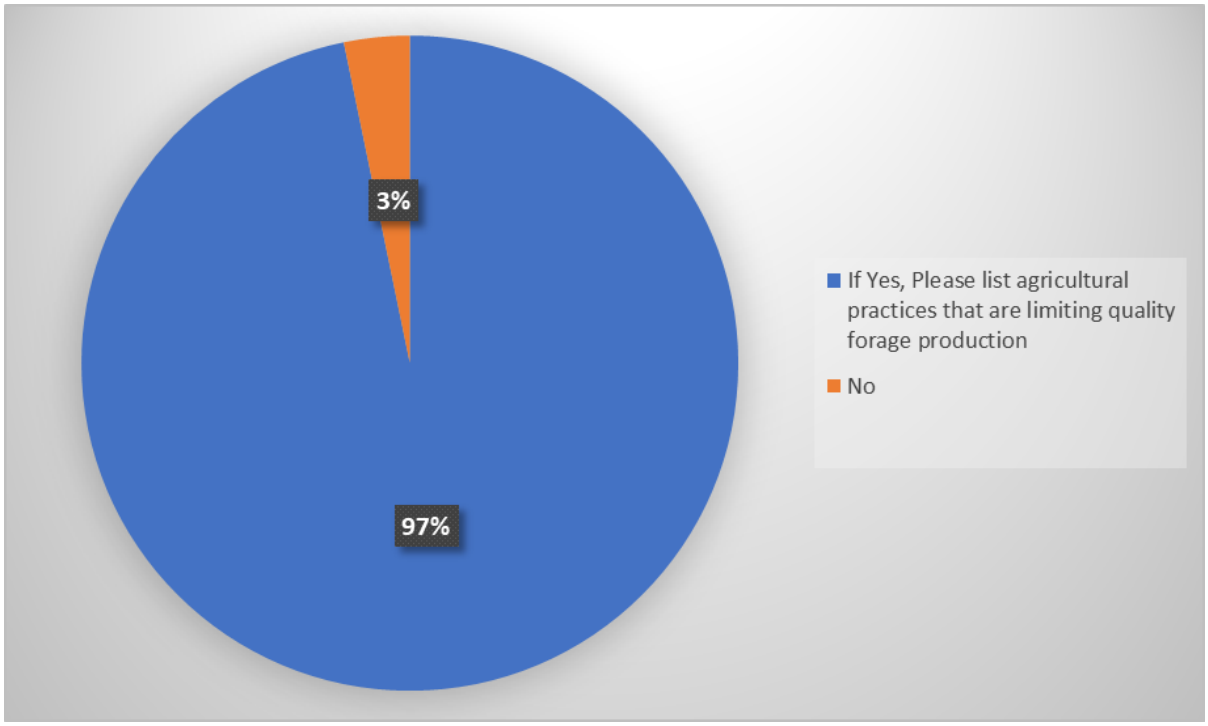


Figure 6.5, Question 20." When improved forage seeds/plant material are available to benefit farmers, do farmers need to improve agricultural practices at the same time? If so list agricultural practices that are limiting quality forage production." The figure 6.5 shows 97% of all respondents answered that agricultural practices need to be improved for forage production. Respondents did not give a listing of practices that are limiting quality forage production on farms but most respondents are of the impression that the agricultural practices farmers are currently using are not adequat.

Figure 6.5. Which measures need to be taken to improve the quality of forages (Q20)



7. Mechanisation

Figure 7.1. Question 21. What is the mechanisation level for forage production and preservation for the small holder dairy farmers? Respondents indicated that the mechanisation level with the small holder farmers is low irrespective of the forage crop the farmers are growing.

Figure 7.1. What is the mechanisation level for forageproduction and preservation for small holder dairy farmers (Q21)

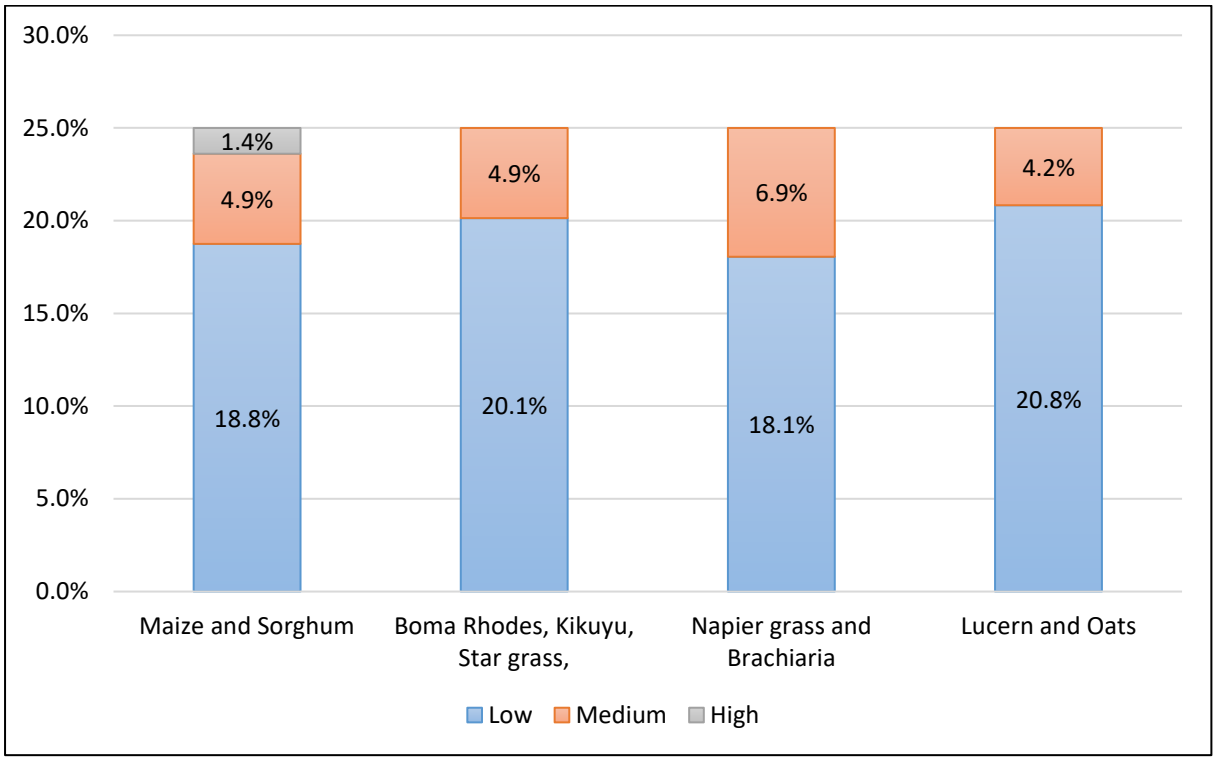


Figure 7.2. Question 22. What is the mechanisation level for forage production and preservation for the medium and large scale dairy farmers? The mechanisation level on medium and large-scale farms is considered medium irrespective of the crops grown as the overall picture. The impression of the consultants is that though the level of mechanisation on medium to large scale farms is higher often old and/or secondhand farm equipment is found in the field resulting in breakdowns during critical stages of production or harvesting

Figure 7.2. What is the mechanisation level for forage production and preservation for medium and large scale dairy farmers (Q22).

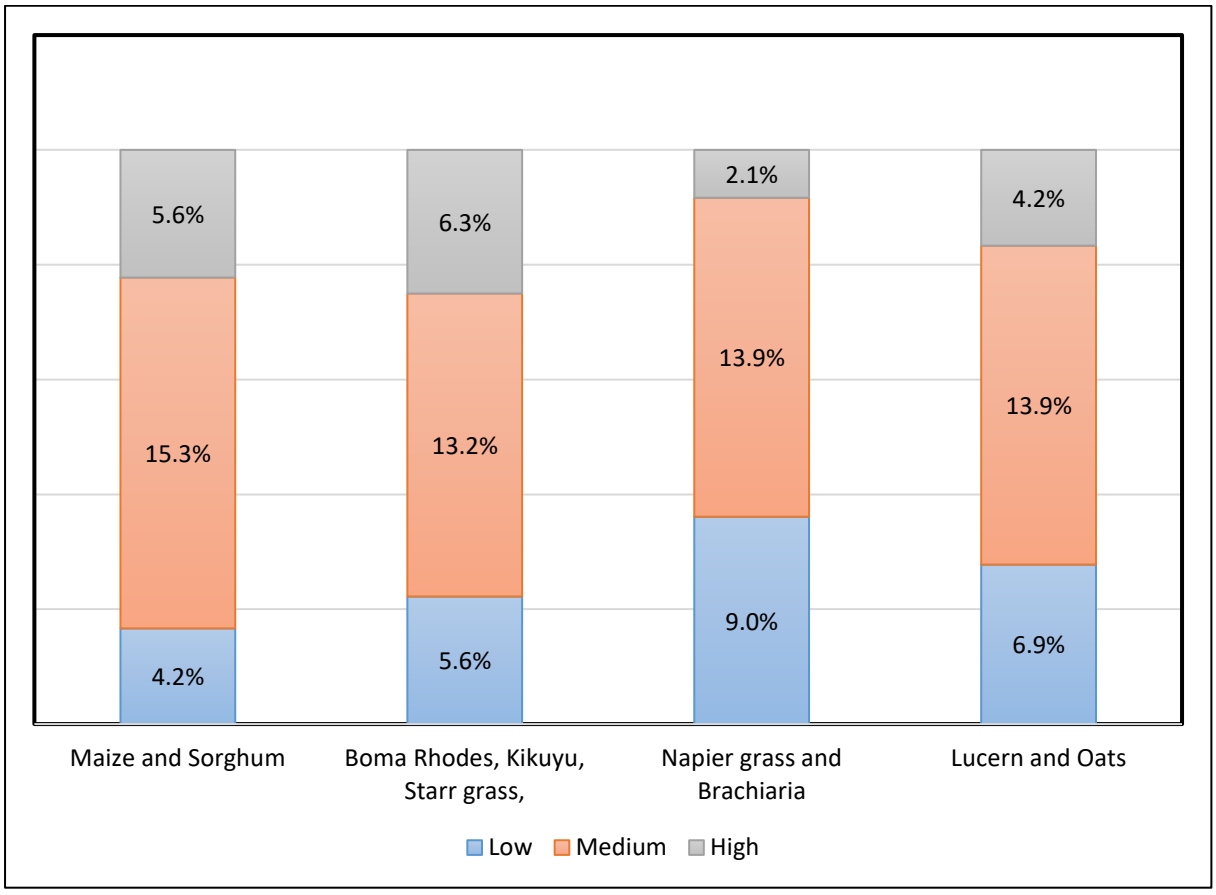


Figure 7.3. Question 21 & 22. "What is the mechanisation level for forage production and preservation for the small, medium and large-scale dairy farmers?"

Medium and large-scale dairy farmers start to mechanize milking and forage harvesting and preservation. However, support services are missing and unless the market for farm machinery and farm equipment and the related service industry starts expands, this will remain a static position (Survey Diagrams; Figure 7.3).

Figure 7.3. Question 21-22. Combined overview.

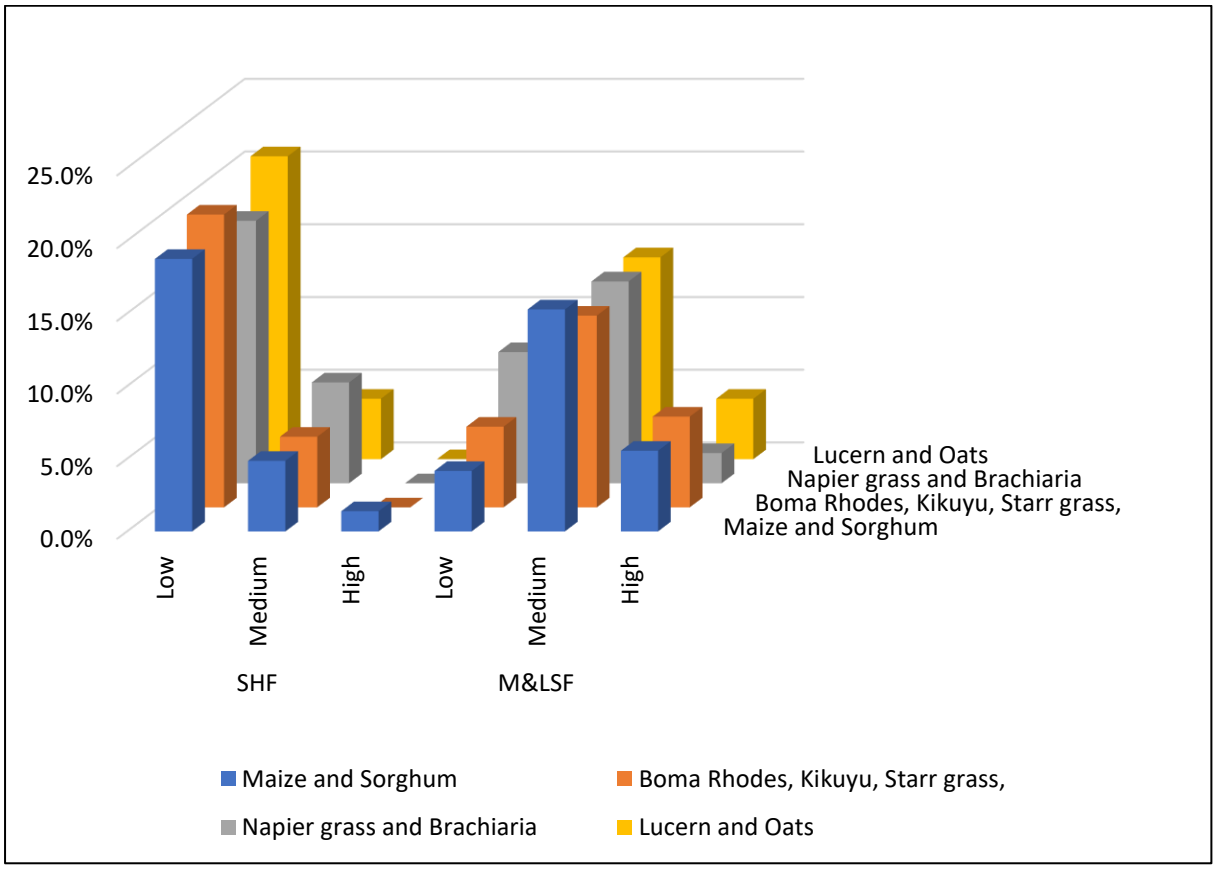


Figure 7.4. Question 23. "What do you think is the main mechanisation problem that is currently hindering the production, quality and utilization of forages on dairy farms?"

According to the survey, lack of appropriate machinery in terms of type and scale is seen by the respondents as the largest constraint for intensive mechanisation (from planting to harvesting to feeding out) (41%). Cost of mechanisation is rated second for all farming systems (27.8%). It is rated first for commercial forage producers, with knowledgable and skilled operators being another concern for this group (Survey Diagrams; Figure 7.4).

Figure 7.4. What do you think is the main mechanisation problem that is currently hindering the production, quality and utilization of forages on dairy farms (Q23)

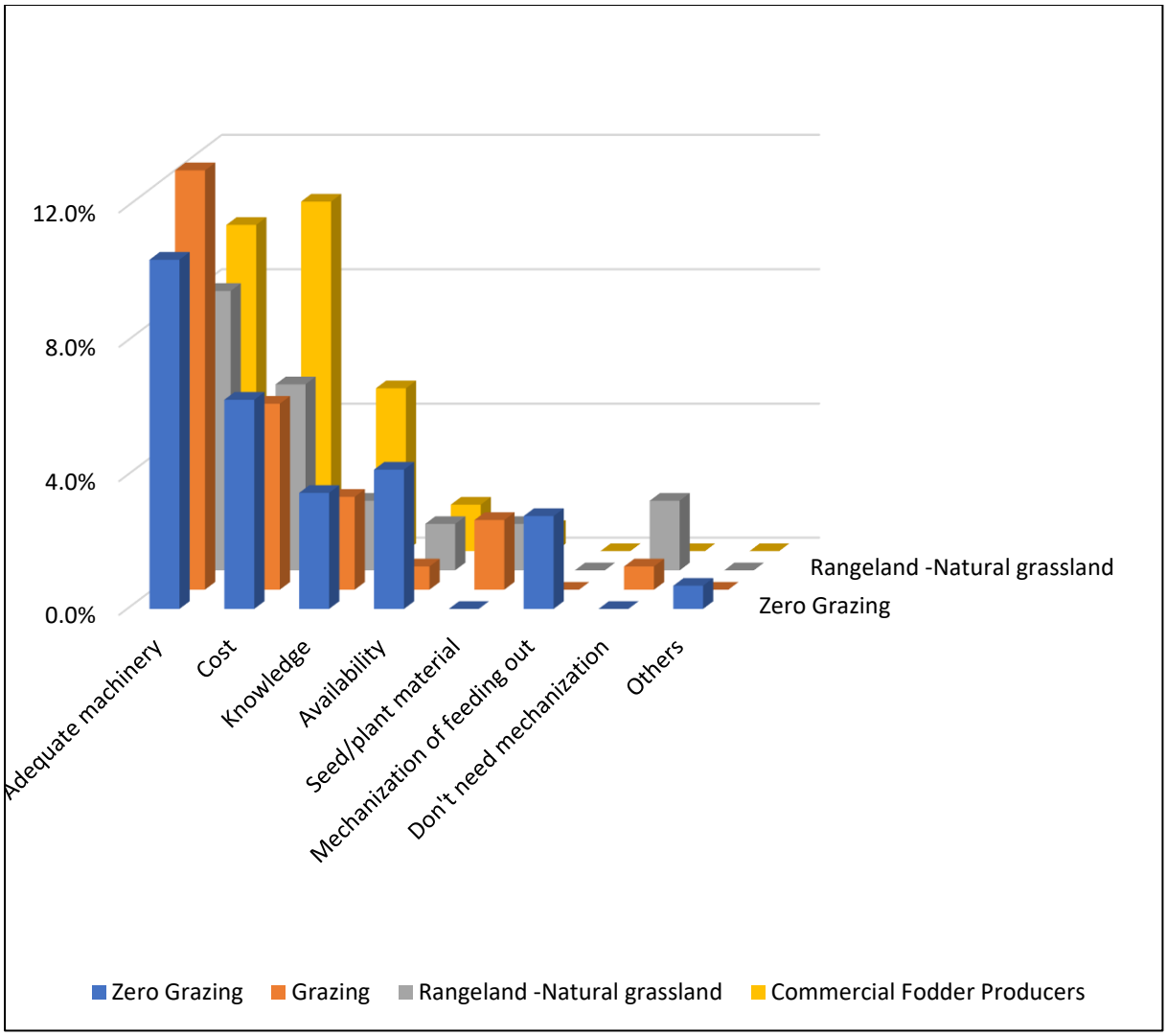


Figure 7.5. Question 24." Would you prefer to promote on-farm mechanisation or use of skilled contractors with appropriate machinery in different dairy systems?"
While there is a demand for skilled contractors, on-farm mechanisation is also seen as a future solution to reduce the burden of an often-heavy workload on the farms and shortage of labour (Survey Diagrams; Figure 7.5).

Figure 7.5. Whould you prefer to promote on-farm mechanisation or use of skilled contractors with appropriate machinery in different dairy systems (Q24).

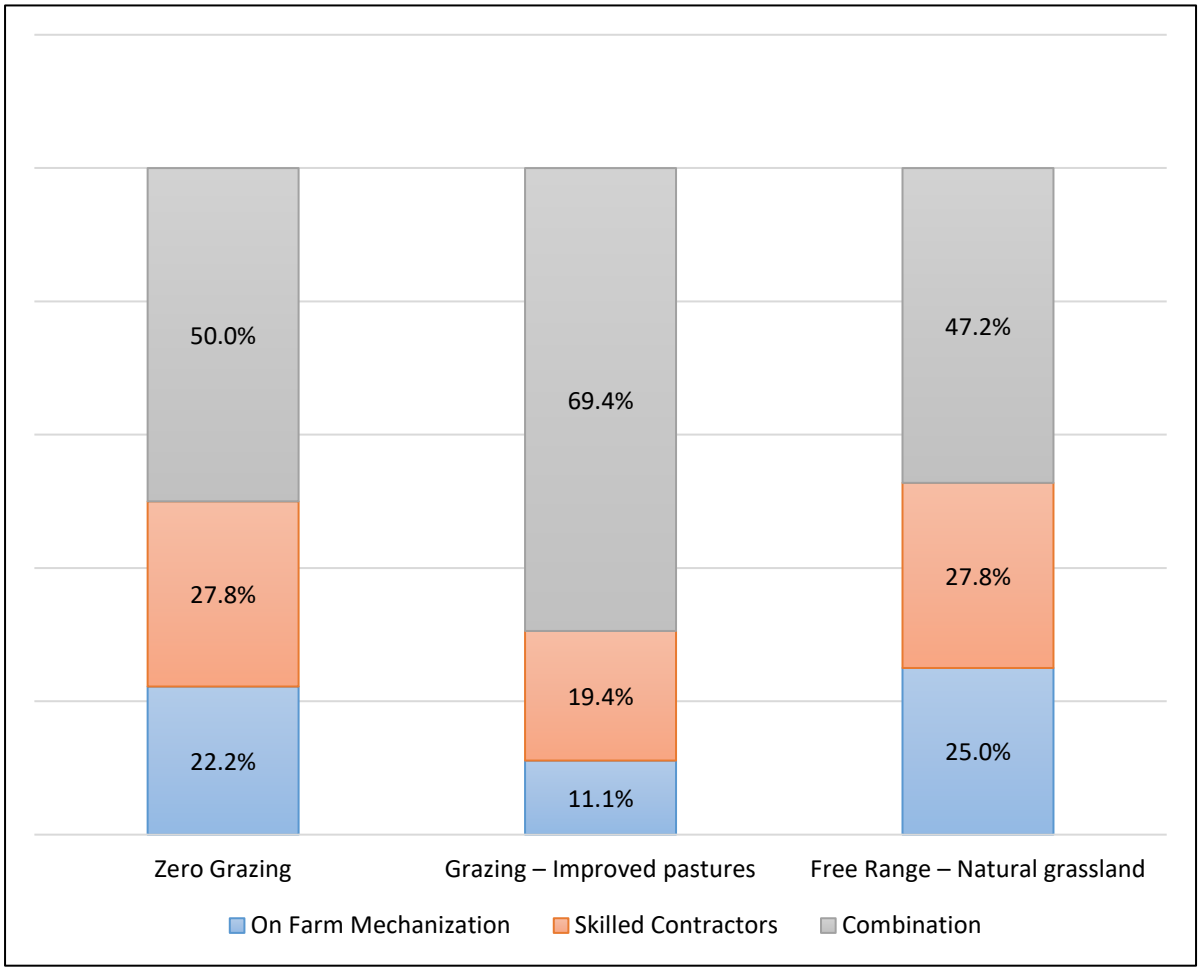
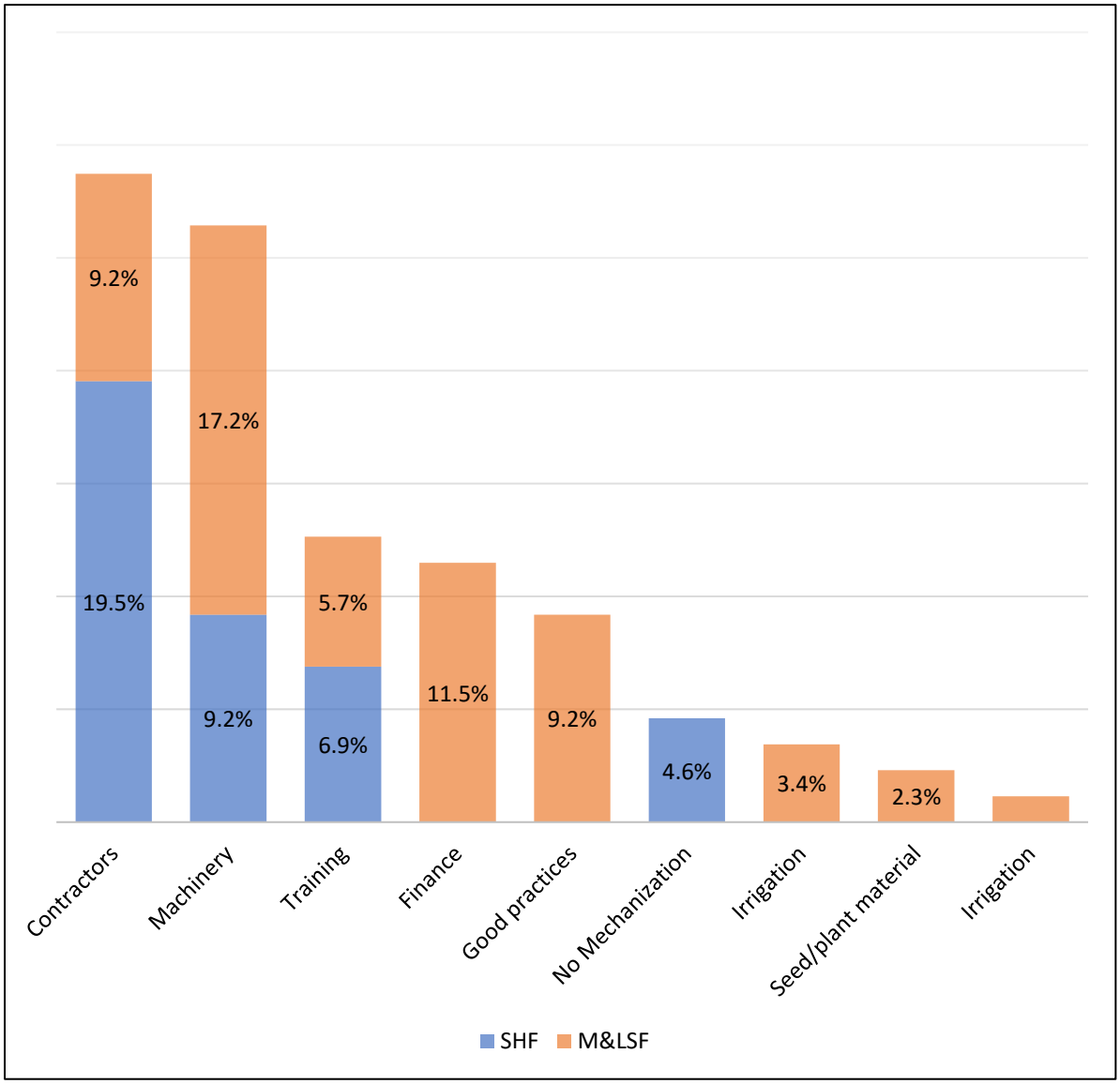


Figure 7.6. Question 25. " What solutions do you suggest for enhanced mechanisation of forage production and preservation in small holder, medium and large scale dairy farms?"

The respondents rated the importance and need of skilled contractors in small holder systems higher (19.5%) than in medium and large farms (9.2%). The option of scaling the machinery is indicated as another solution to enhanced forage production in Kenya (9.2% for SHF and 17.2% for M&LHF) (Survey Diagrams; Figure 7.6).

Figure 7.6. What solutions do you suggest for enhanced mechanisation of forage production and preservation in small holder, medium and large-scale dairy farms (Q25).



8. Inputs and services

Figure 8.1. Question 26.""" What is your perception of the quality of the input suppliers and service providers in relation to forages, on a scale of 1 - 5 (1 = poor, 5 = excellent)?"
The perception of the quality of the input suppliers and service providers ranges from below average to average. Services like supply of inputs for silage making, agricultural contractors and feed laboratories are perceived as either low or not existing (Survey Diagrams; Figure 8.1).

Fig 8.1. What is your perception of the quality of the input suppliers and service providers in relation to forages? (Q26)

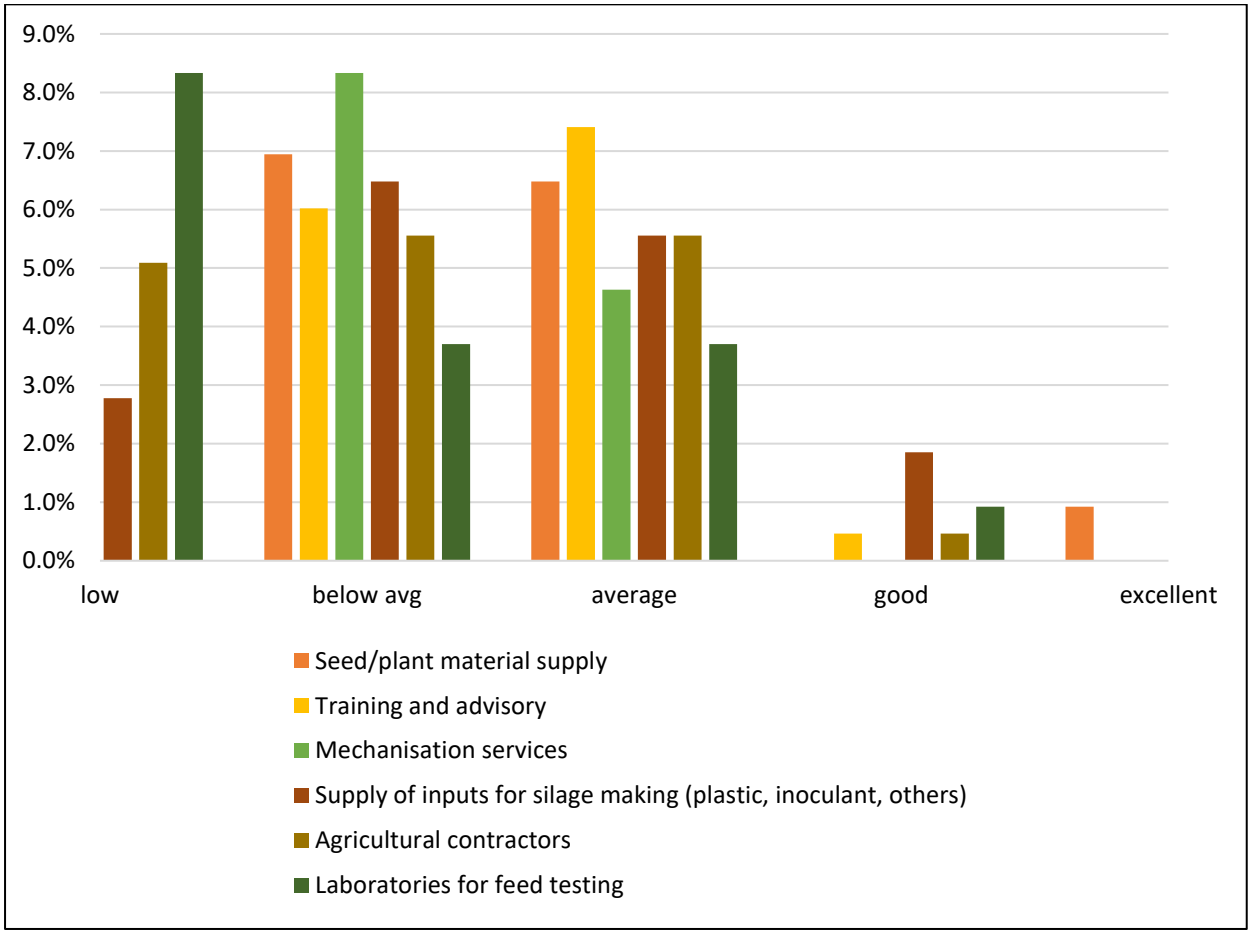
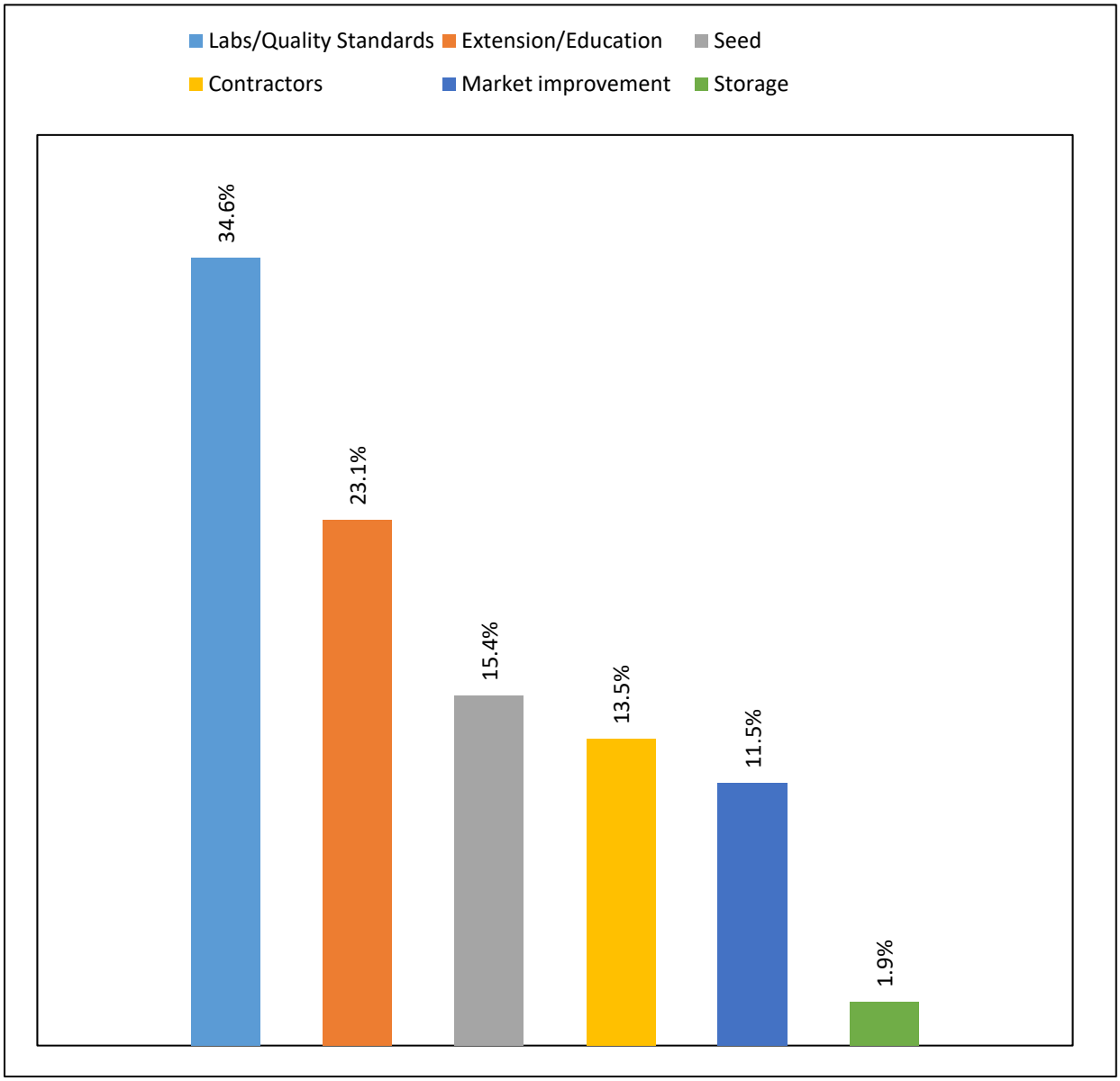


Figure 8.2. Question 27" Which services, according to you, are missing in the Kenyan forage market?"
Lack of a quality feed lab and of feed standards was mentioned by 34.6% of the respondents as the major missing link, followed by training for extension services (23.1%), seeds of forage crops (15.4%), contracting services (13.5%), and market improvement (11.5%) (Survey Diagrams; Figure 8.2).

Fig. 8.2. Which services, according to you, are missing in the Kenyan forage market? (Q27)



Question 28
The answers given were very diverse and therefor not categorized in a summary but the information has been used while writing the main document.

9. Forage market

Figure 9.1. Question 29." What kind of forages can you find nowadays being offered for sale in the market (e.g. fresh/green forages, imported forages, grass hay, wheat straw, silage, etc.)?"
According to the respondents of the questionnaire, hay (31.4%) is the main product in the market, followed by fresh cut forages (26.7%), maize silage (16.2%) farm by-products (9.5%) and straw (8.6%), Lucerne hay (5.7%) and sorghum silage (1.9%) (Survey Diagrams; Fig. 9.1).

Fig 9.1. What kind of forages can you find nowadays being offered for sale in the market ? (Q29)

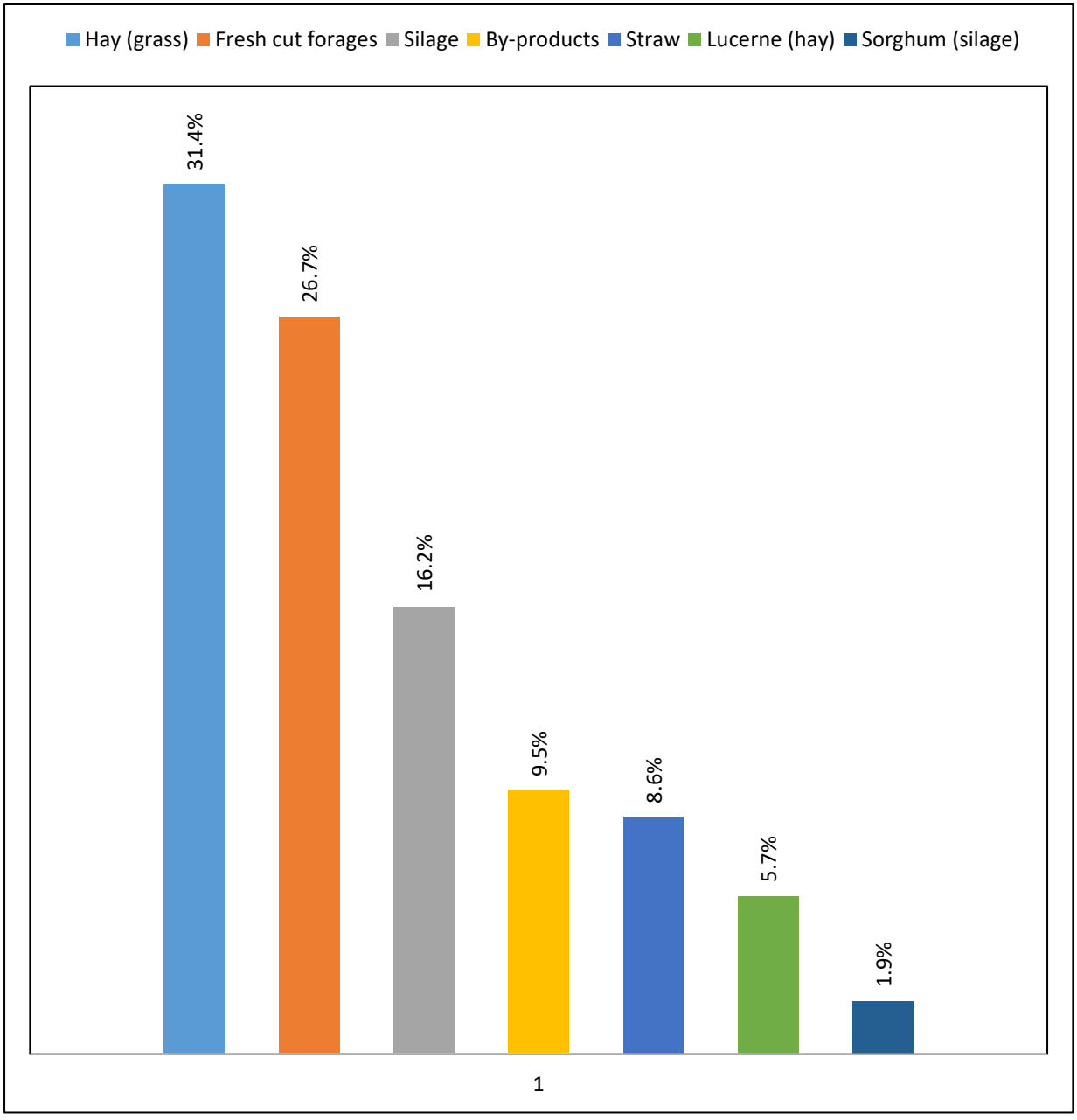


Figure 9.2. Question 30." How would you define the actual forage market (e.g. seasonal, opportunistic, formal/informal, quality control, standards, etc.)?"

Forage trading is carried out through formal and informal channels. The informal channel includes farmers and small traders who directly buy from small producers – even the localized trading of fresh forage (e.g. Napier grass and grass cut along the roadside) between one farmer and another – and it is the dominant channel of forage trade. The formal channel comprises commercial forage producers, traders, and agro vets that purchase forage from medium- and large-scale producers and directly deliver the forage to dairy farmers, ranches and cooperatives. They are licensed for forage trade. The respondents in the questionnaire defined the Kenyan forage market mainly as seasonal (45%) and informal (32%) (Survey Diagrams; Figure 9.2).

Figure 9.2. How would you define the actual forage market? (Q30)

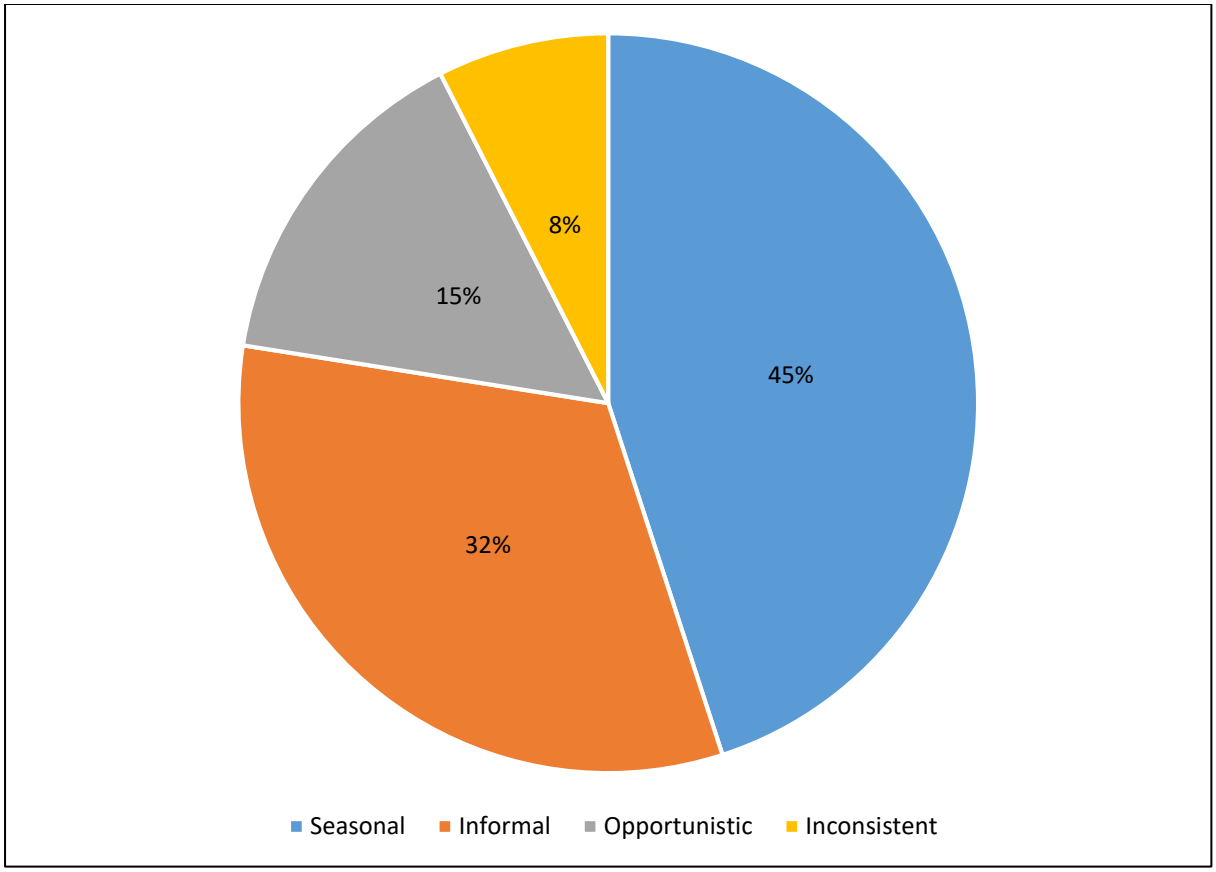


Figure 9.3, Question 31.1. " What opportunities and bottlenecks are there in the commercialization of forages?(List at least three in order of importance) The biggest opportunity the respondents see in the growing forage market (48%) while 29% of the respondents mentioned that new technologies that have become available the last couple of years open up possibilities, next to hay to commercialize the forage market.

Figure 9.3. What opportunities are there in the commercialization of forages? (Q31.1)

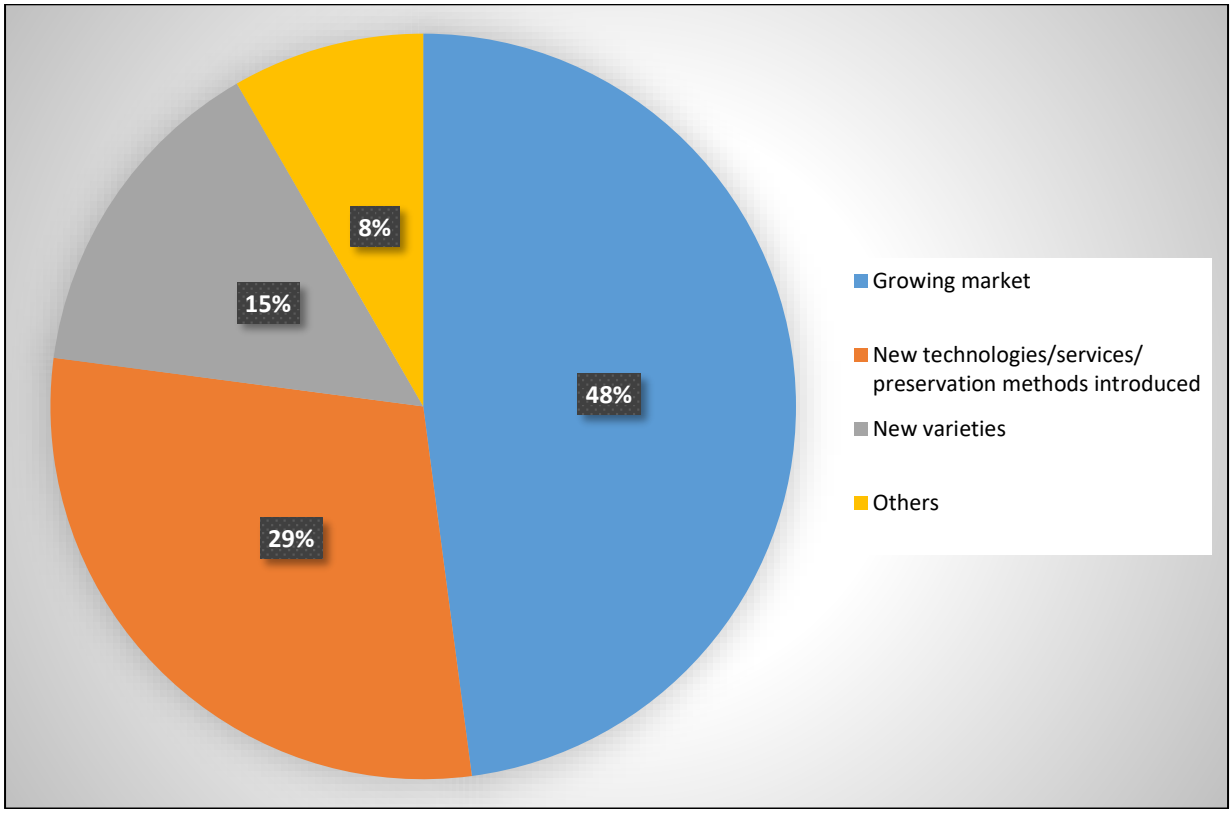


Figure 9.4. Question 31.2 " What bottlenecks are there in the commercialization of forages?(List at least three in order of importance)". The biggest bottleneck the respondents see in the commercialization of forages is the availability of forages seeds/varieties which produce quality forages (27%). 20% believe the absence of quality standards in the forage market is the second biggest bottleneck while 18% of respondents mention seasonality.

Figure 9.4. What bottlenecks are there in the commercialization of forages? (Q31.2)

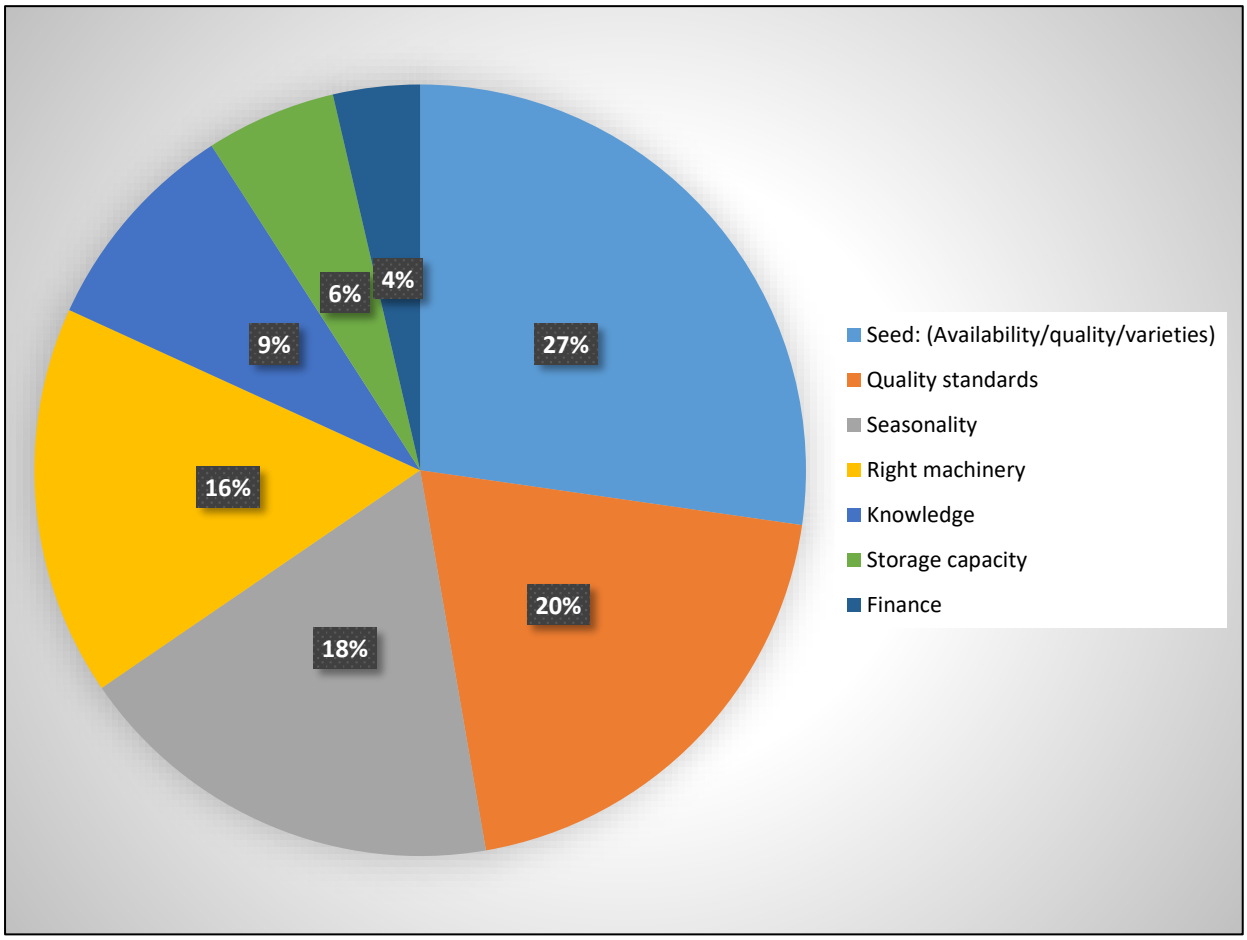


Figure 9.5, 9.6. Question 32. " What improvements and changes need to be made by commercial forage producers to improve forage production in terms of yield and quality?"

Q 32 and 33 which are presented at the end of the questionnaire, are presented here under the heading forage quality. According to the survey, the most effective improvements to increase forage yield are related with better management practices (35%), soil and fertilization (23%) and the use of improved forage varieties (16%) (Survey Diagrams; Figure 9.5). Forage quality is seen by the respondents as an important point to be addressed. This can be achieved through introduction of new forage species and varieties, but if not well managed it will not be effective. Equally better management of current forages in the market will be effective as well. The respondents to the questionnaire indicated that to improve forage quality, commercial forage producers need to implement better forage crop management practices (47%), followed by the use of improved/new varieties (27%), quality standards (15%), education and skills training (9%), and machinery (2%). When a new species is introduced, this may require an extra investment if different machinery is required for planting and/or harvesting of particular forage crop (Survey Diagrams; Figure 9.6).

Figure 9.5, Yield (Q32.1)

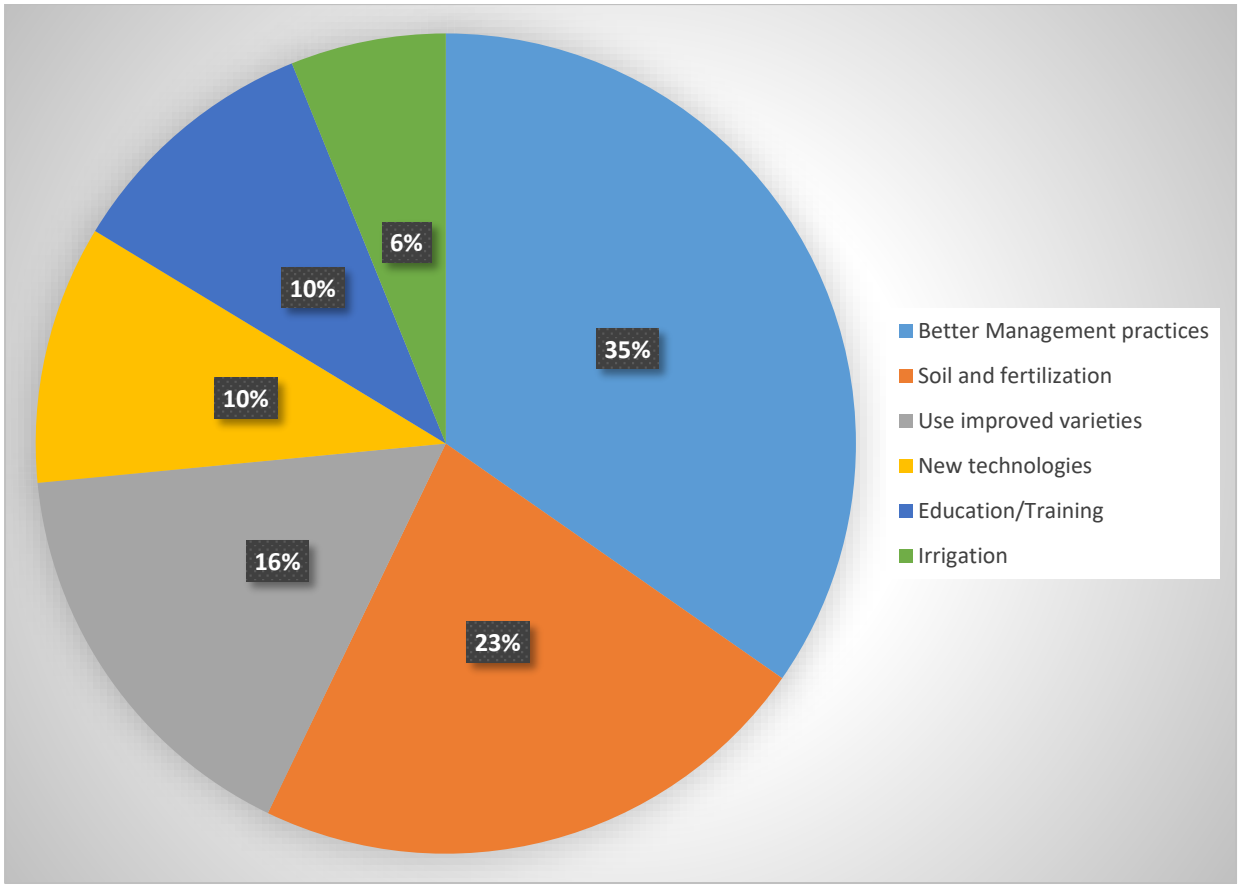


Figure 9.6, Quality (Q31.2)

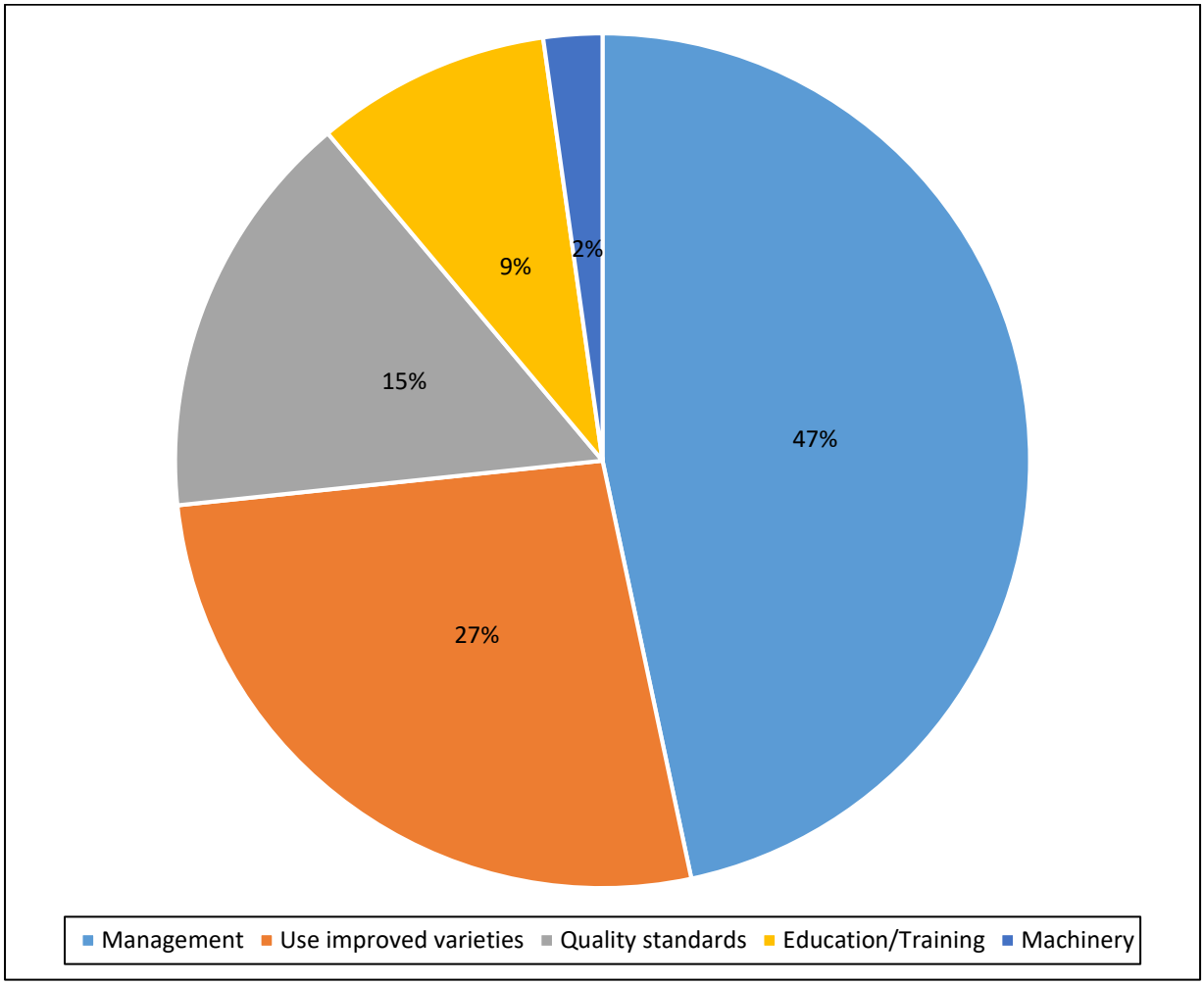


Figure 9.7, Question 33." What affects production levels and cost price of raw milk mostly: the quality of forages or of compounded feeds (please explain)?"
Fifty six percent of the respondents indicated that forages in the ration of dairy cows affect production level and cost of production the most. The influence on production level and costs of production of concentrates was considerable smaller (25%) (Survey Diagrams; Figure 9.7).

Figure 9.7. What affects production levels and cost price of raw milk mostly: the quality of forages or of compounded feeds? (Q33)

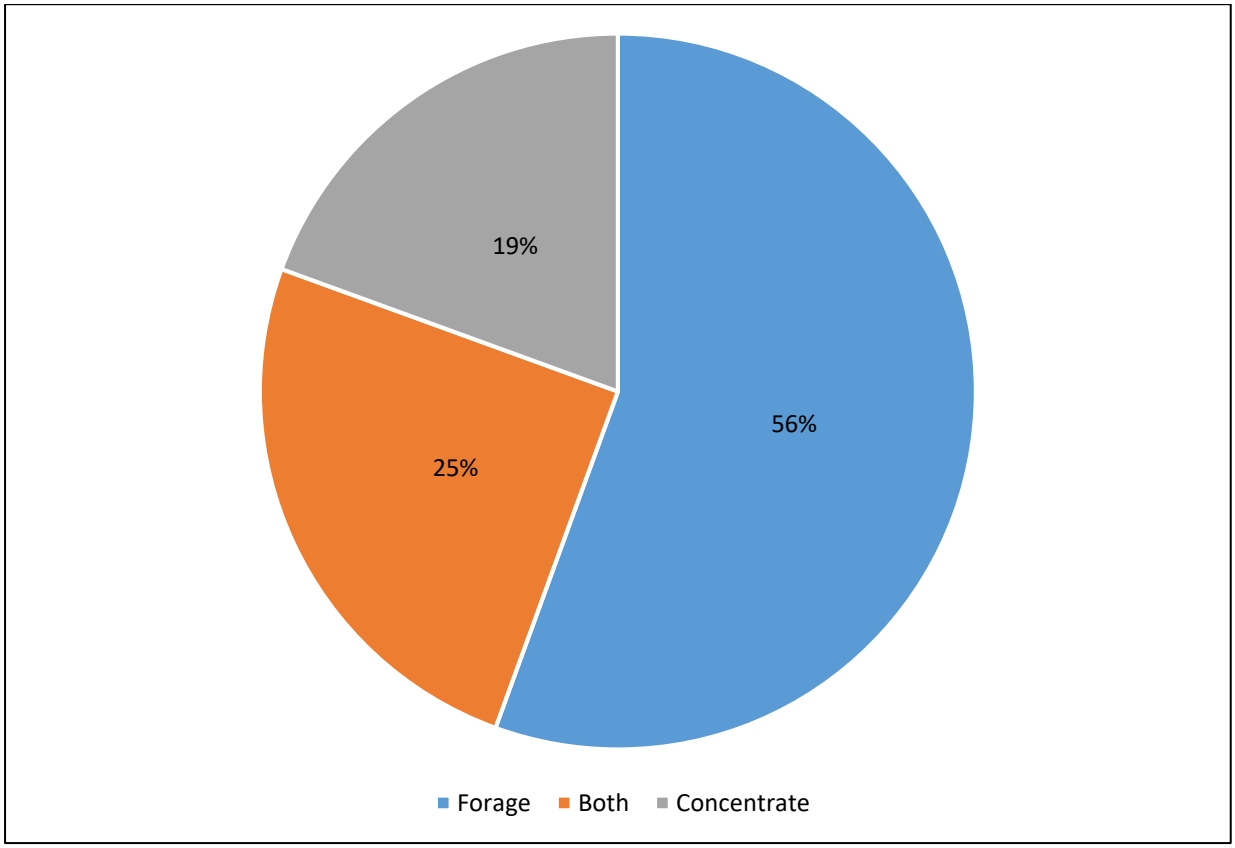


Figure 9.8, Question 34.1. **"What is your opinion on the opportunity of <u>on farm</u> forage production in agro-forestry systems?"** 81% of the respondents see opportunities (40% good and 41% some) for forage production on farm in combination with agro forestry systems.

Figure 9.8, The opportunity of <u>on farm</u> forage production in agro-forestry systems? (Q34.1)

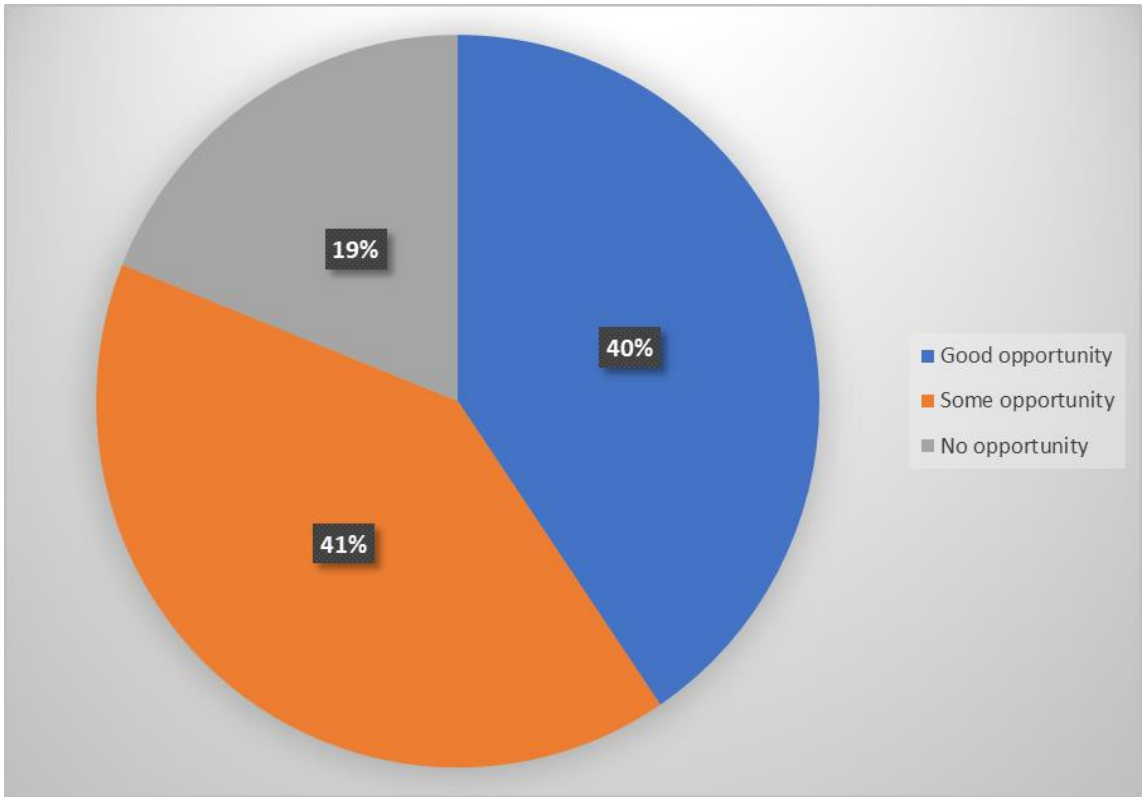
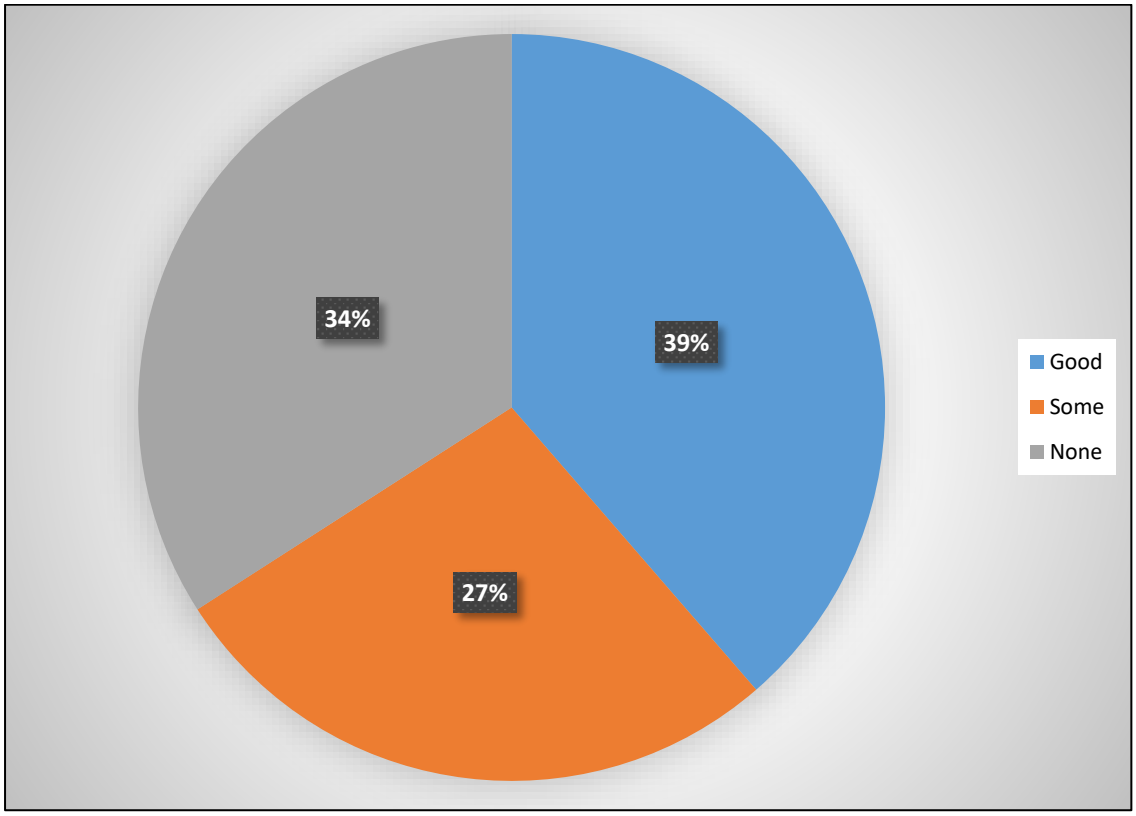


Figure 9.9, Question 34.2. "What is your opinion on the opportunity of commercial forage crop production in agro-forestry systems? 66% of the respondents believe that forage production in agro-forestry systems can be commercialized. 39% responded that this is well possible while 27% responded it will somehow be possible.

Figure 9.9, The opportunity of commercial forage crop production in agro-forestry systems? (Q34.2)



10. Education and training

Figure 10.1. Question 35." What is the availability and quality of education and training on forage production, preservation and inclusion of dairy cow ration formulation in the country?"
Among the respondents of the questionnaire, (i) 34% answered that training is not available, (ii) 27% that it is not available for the majority of farmers, (iii) 15% that is available but not targeting the right group, (iv) 9% that it is available only in institutes of higher education, and (v) 3% that contradictive information is provided, thus confusing farmers (3%) (Survey Diagrams; Figure 10.1).

Figure 10.1. What is the availability and quality of education and training on forage production, preservation and inclusion of dairy cow ration formulation in the country? (Q35)

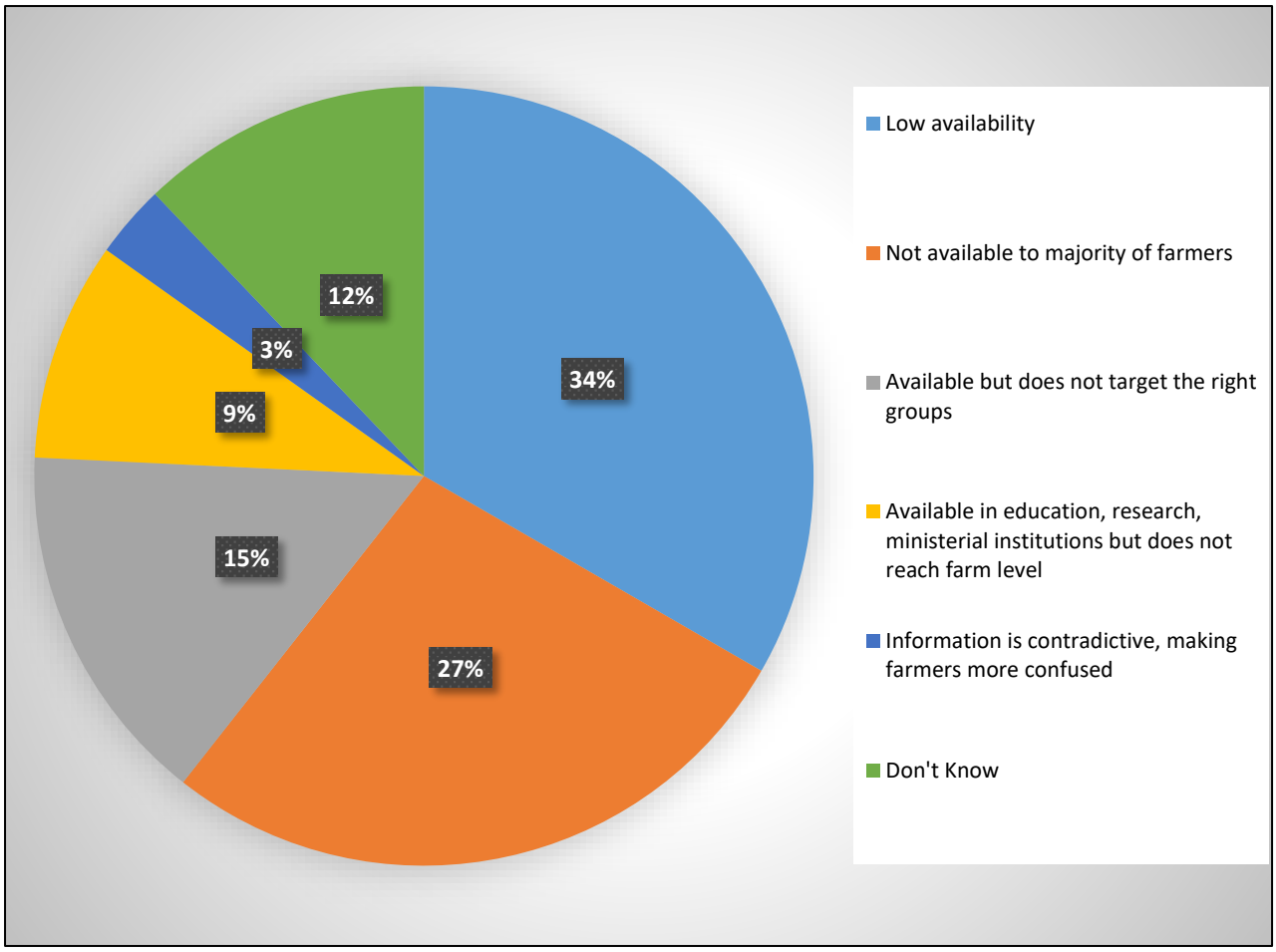


Figure 10.2. Question 36." What knowledge and skills are lacking in regard to forage production and preservation?"
Good agricultural/farming practices is considered by 22.8% of the respondents as the key missing skill causing the gap in forage production and preservation in Kenya; 21.1% indicated that there was an overall lack of knowledge and skills (Survey Diagrams; Figure 10.2).

Figure 10.2. What knowledge and skills are lacking in regard to forage production and preservation? (Q36)

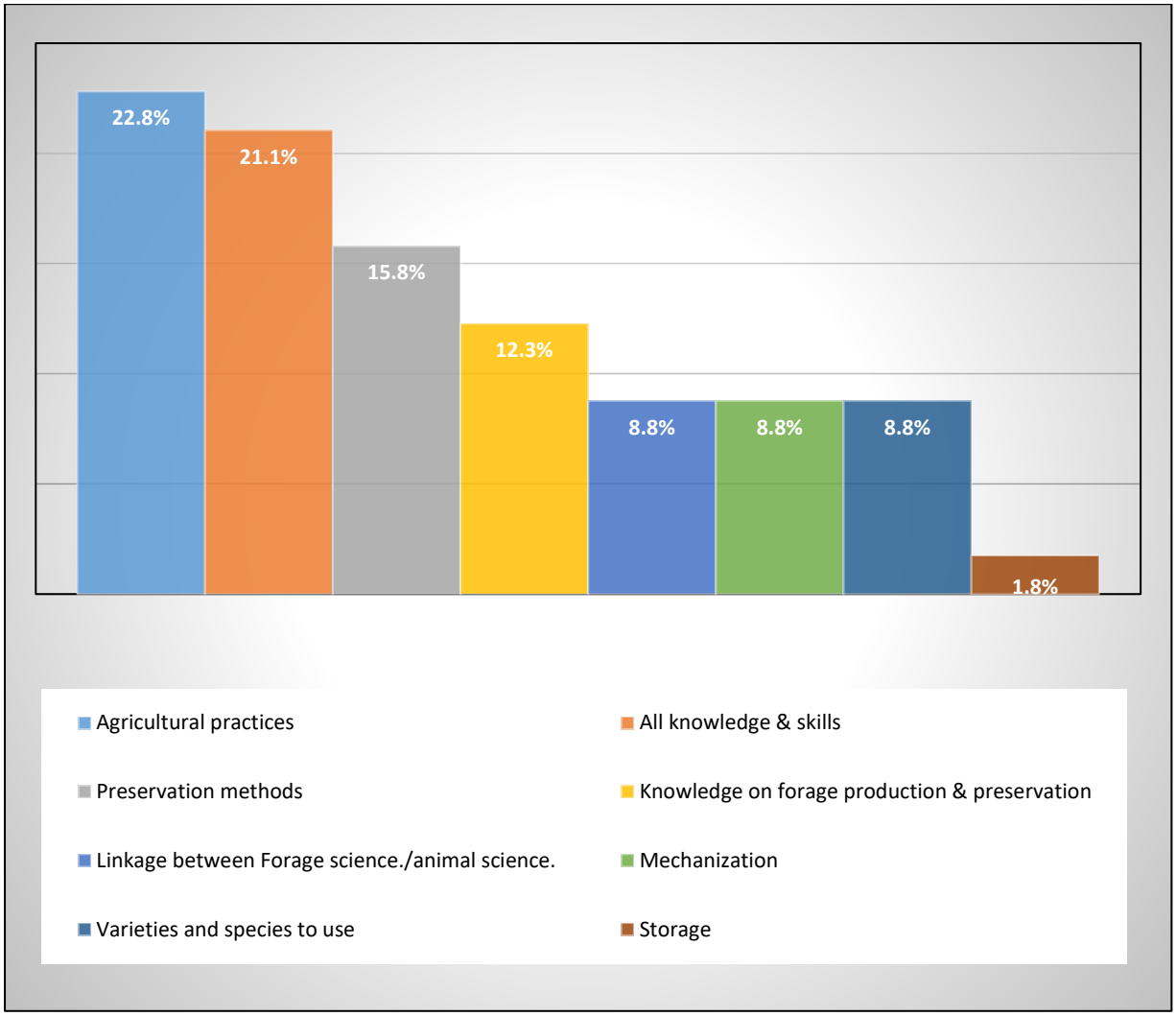


Figure 10.3. Question 37." Who should provide this training?"
According to the survey, this training should be provided by either (i) government institutions (33.9%), (ii) private sector (30.5%), or (iii) a combined effort of the public and private sector (13.6%), (Survey Diagrams; Figure 10.3).

Figure 10.3. Who should provide this training? (Q37)

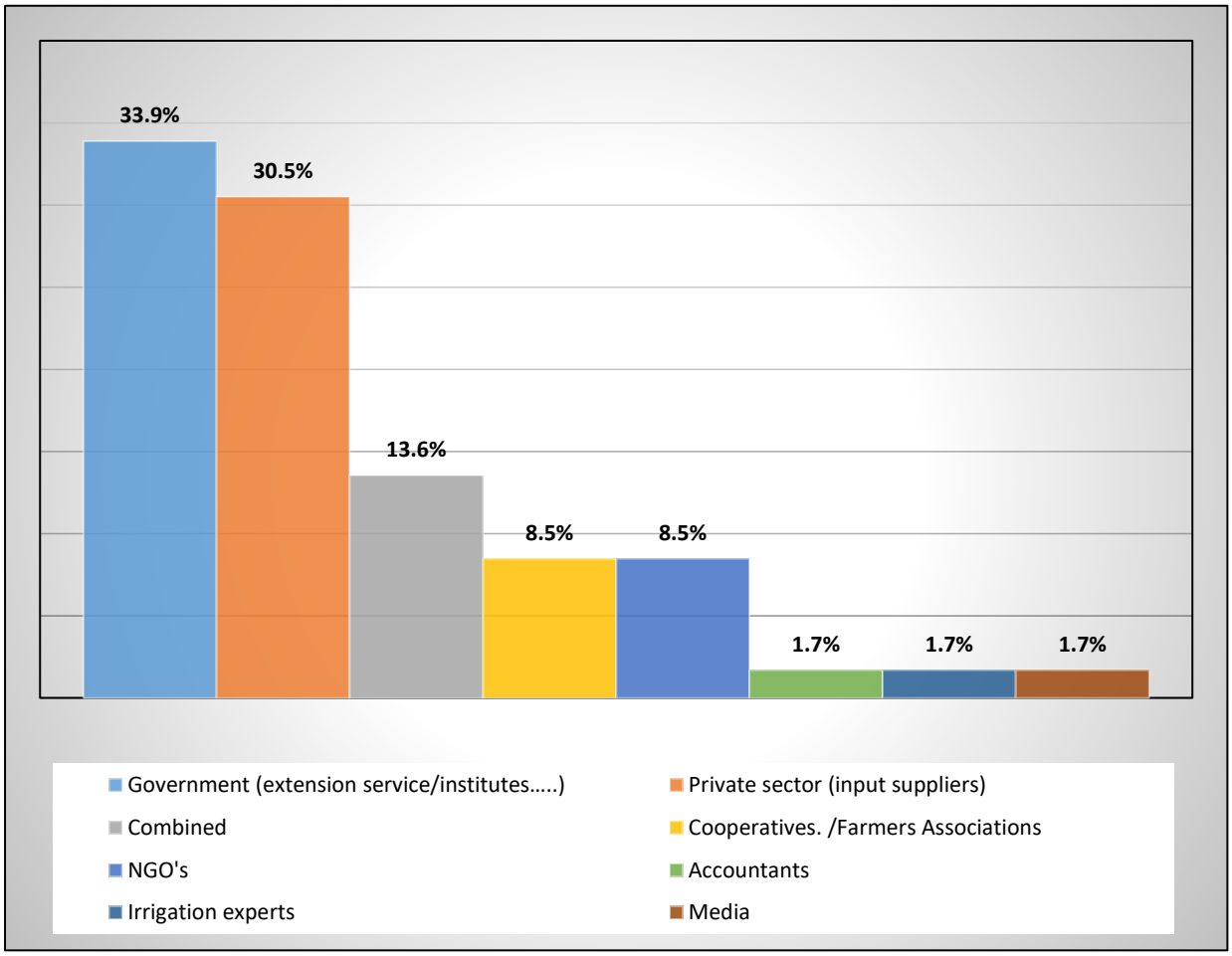
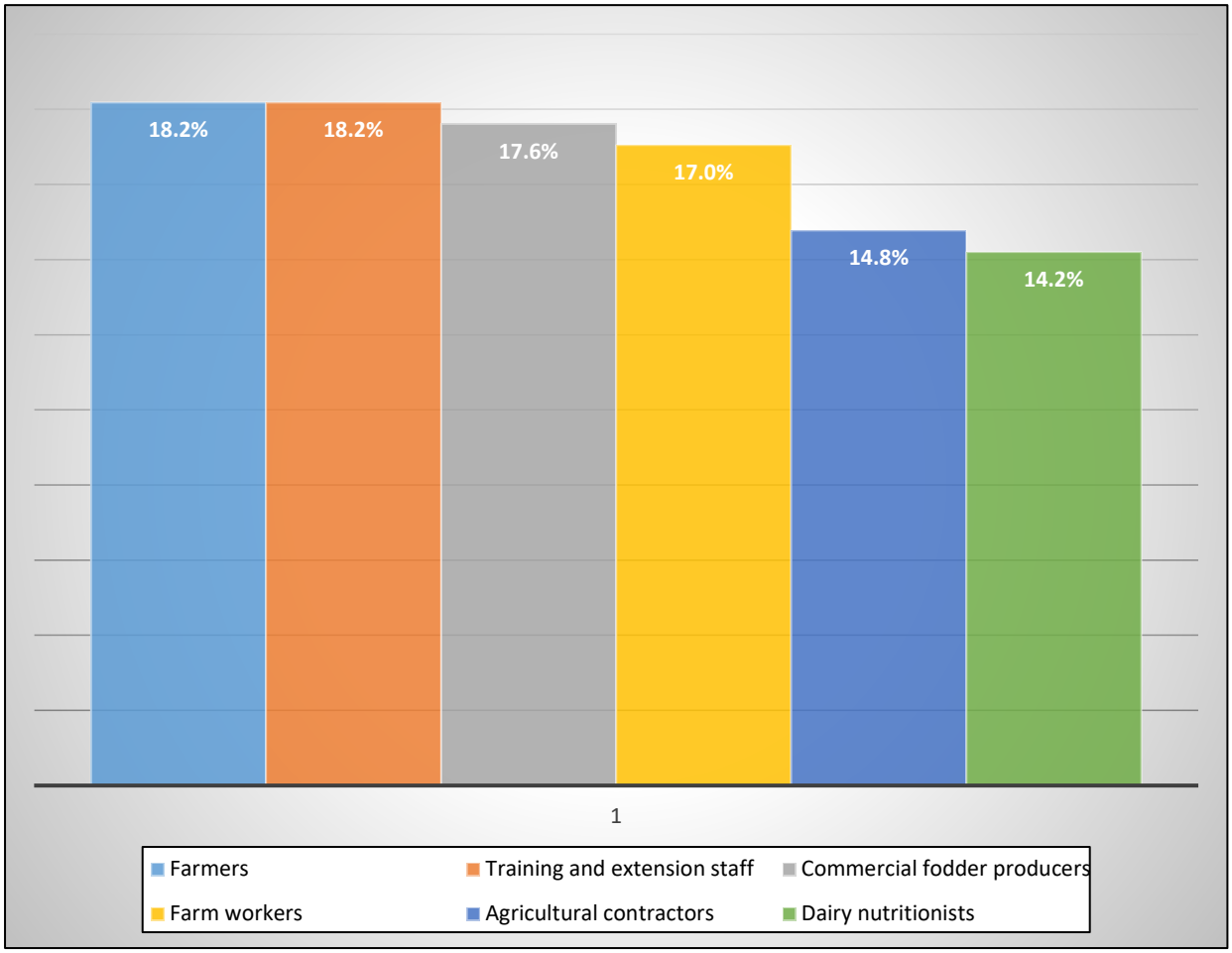


Figure 10.4. Question 38." Who should be trained?"
According to the survey, all the stakeholders involved in forage production need to be trained. These were rated as follows: (i) farmers (18.2%), (ii) training and extension staff (18.2%), (iii) commercial forage producers (17.6%), (iv) farm workers (17.0%), (v) agricultural contractors (14.8%) and (vi) dairy (ruminant) nutritionists (14.2%) (Survey Diagrams; Figure 10.4).

Figure 10.4. Who should be trained? (Q38)



11. Environmentally sustainable forage production

Figure 11.1. Question 39" How do you rate the effect on the environment of current agricultural practices as regards forage production and preservation?
Respondents consider that the effect of current practices of forage production and preservation on the environment is either neutral (59%), or negative (23%) (Survey Diagrams; Figure 11.1).

Fig 11.1. How do you rate the effect on the environment of current agricultural practices as regards forage production and preservation? (Q39)

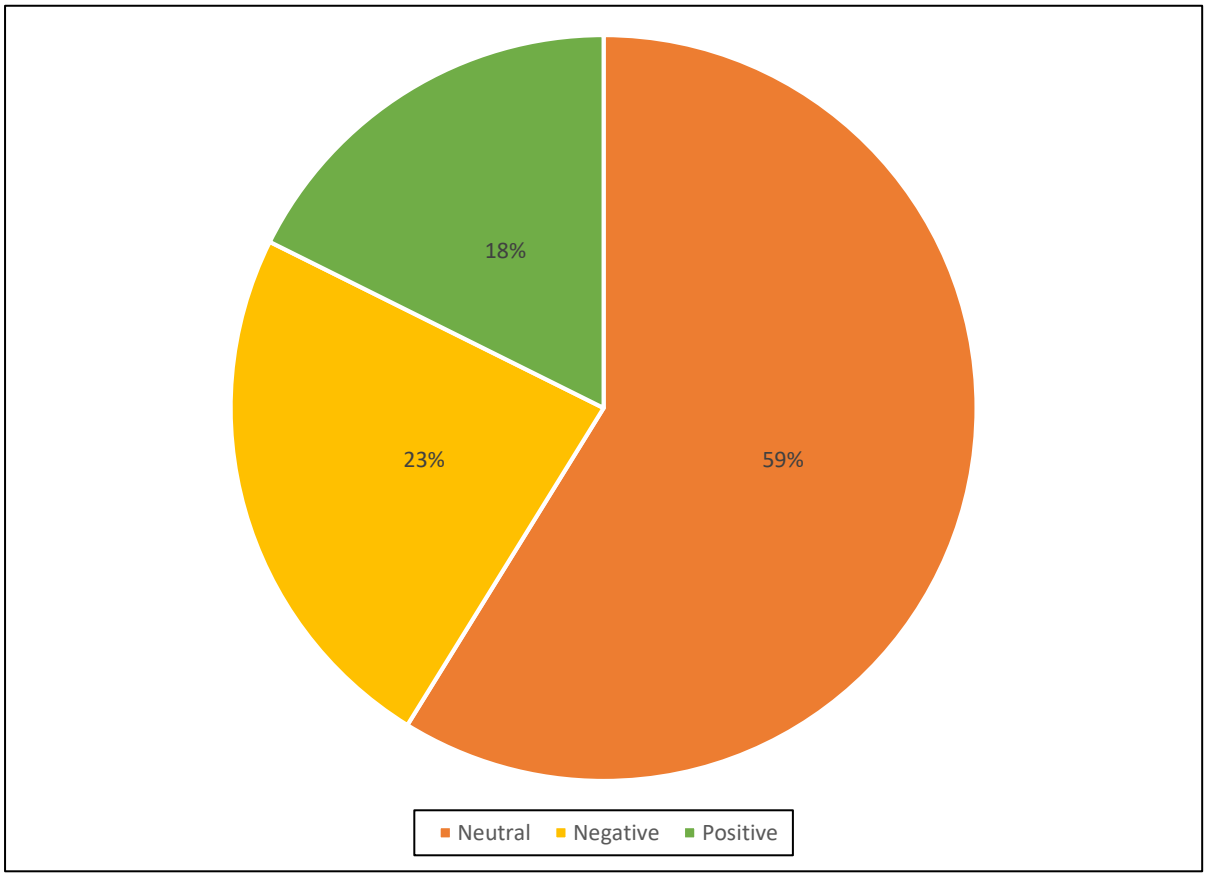


Figure 11.2. Question 40." What is in your opinion the contribution of current forage production and preservation towards an environmentally sustainable dairy industry?"
According to the respondents 47% the contribution of current forage production practices as neutral, whereas 29% consider that current practices contribute positively towards a sustainable dairy industry (Survey Diagrams; Figure 11.2).

Fig. 11.2. What is in your opinion the contribution of current forage production and preservation towards an environmentally sustainable dairy industry? (Q40)

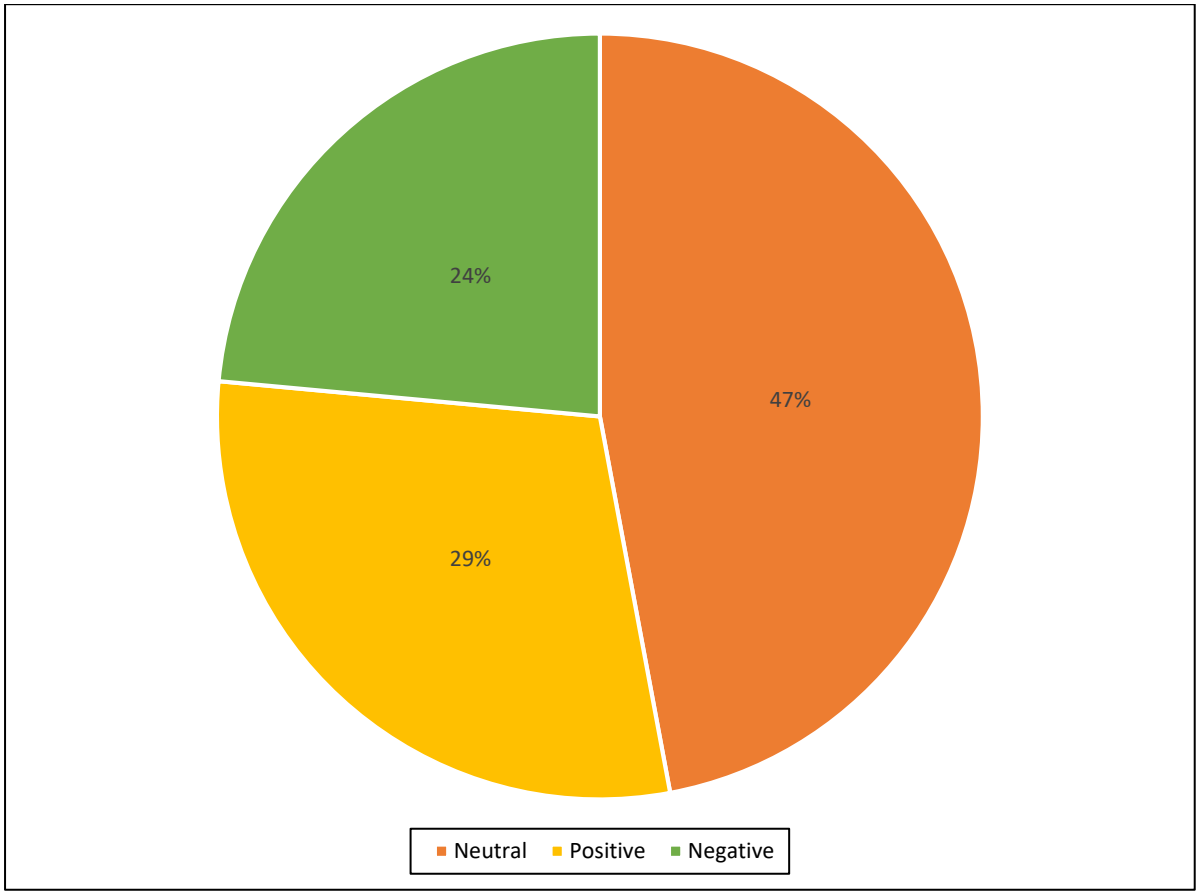


Figure 11.3. Question 41 Which good practices, interventions would you recommend as regards the forage sub-sector to reduce the (negative) impact on the environment?

Better land management practices was the option chosen by 22.7% of the responders, followed by manure management (20.5%), and the use of forage-based ration balancing (13.6%) (Survey Diagrams; Figure 11.3).

Fig. 11.3 Which good practices, interventions would you recommend as regards the forage sub-sector to reduce the (negative) impact on the environment? (Q41)

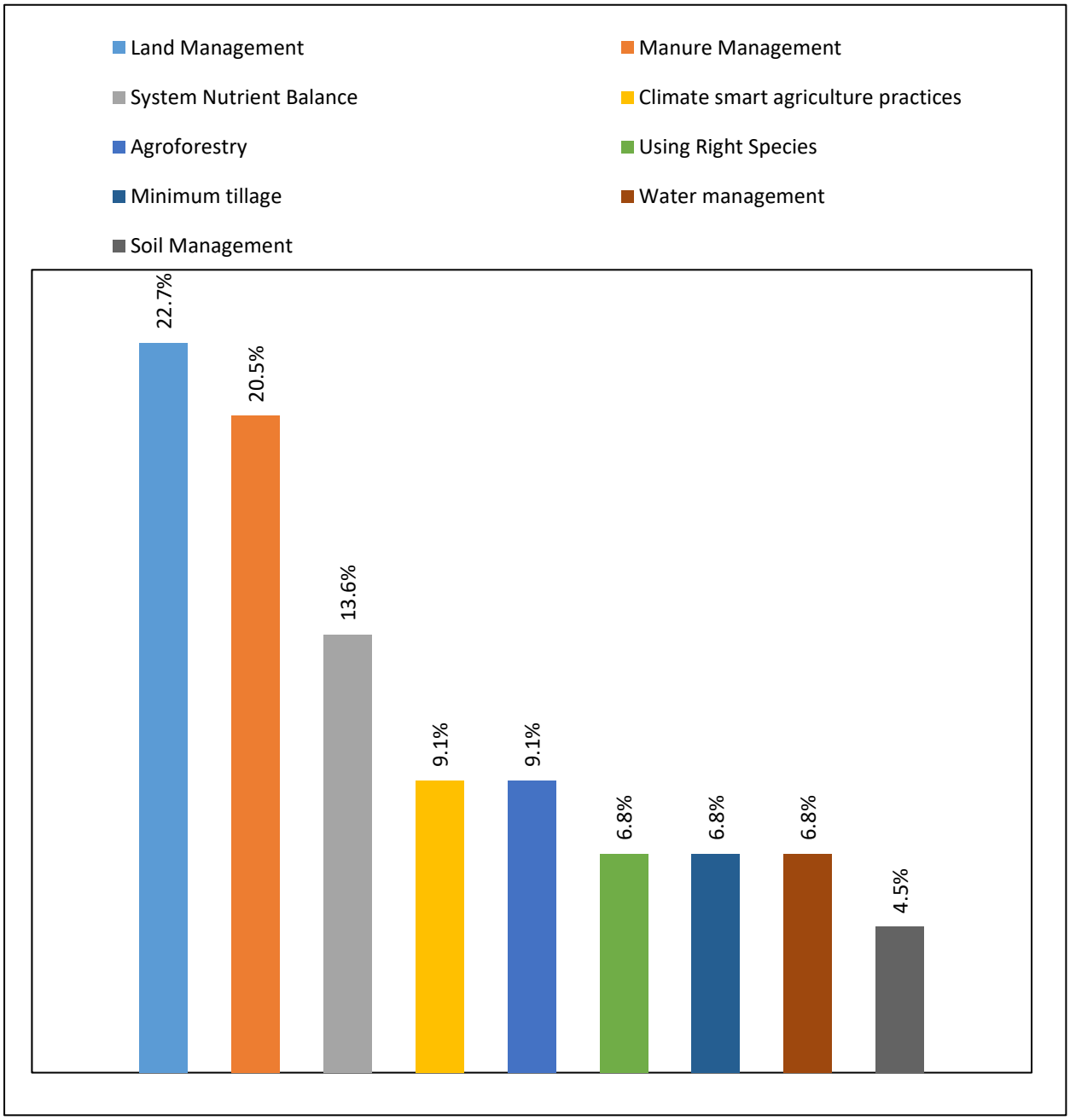


Figure 11.4. Question 42." What other recommendation do you have – beyond forage production and preservation - for reduced environmental footprint for the Kenyan dairy industry?"
The three main recommendations the respondents gave to reduce the environmental footprint of the dairy industry in Kenya were (i) advising the farmers on forage based ration balancing for their dairy cows (28.9%), (ii) installing and producing biogas at the farm level (18.4%), and (iii) a change in breeding strategy (13.2%) (Survey Diagrams; Figure 11.4).

Fig. 11.4. What other recommendation do you have – beyond forage production and preservation - for reduced environmental footprint for the Kenyan dairy industry (Q42)

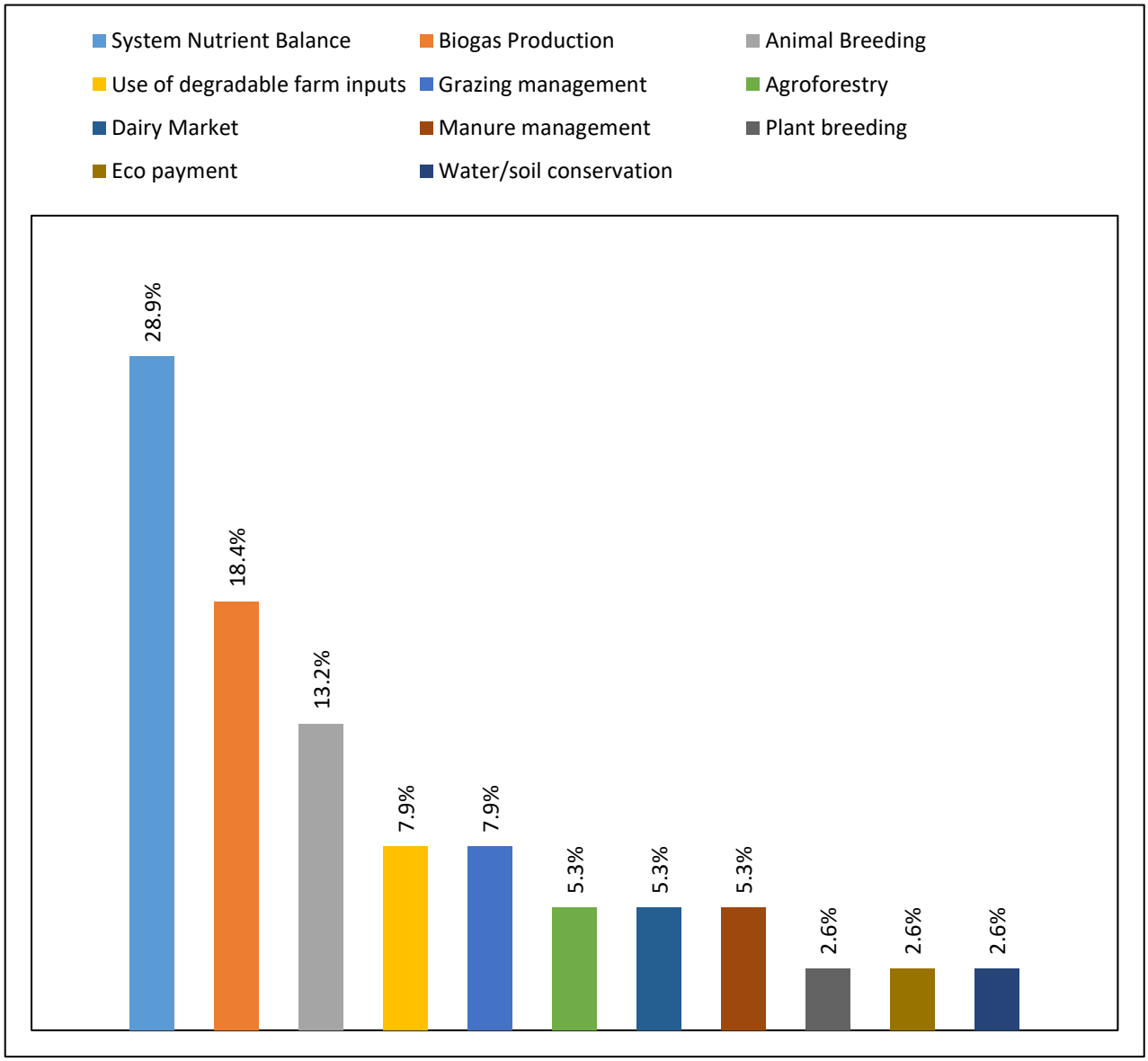


Figure 11.5. Question 43." Are there any regulations/policy requirements in place that you are aware of to reduce the environmental impact of livestock production systems (national or County level)?"

The majority of the respondents consider that there are no regulations/policy requirements in place they are aware of, to reduce the environmental impact of livestock production systems on either County or at national level (69%) (Survey Diagrams; Figure 11.5). However, the new Crops (Food Crops) Regulation Act, 2018 recently (March 2019 announced) seeks to tighten regulations governing food production, processing and marketing.

Fig. 11.5. Are there any regulations/policy requirements in place that you are aware of to reduce the environmental impact of livestock production systems? (Q43)

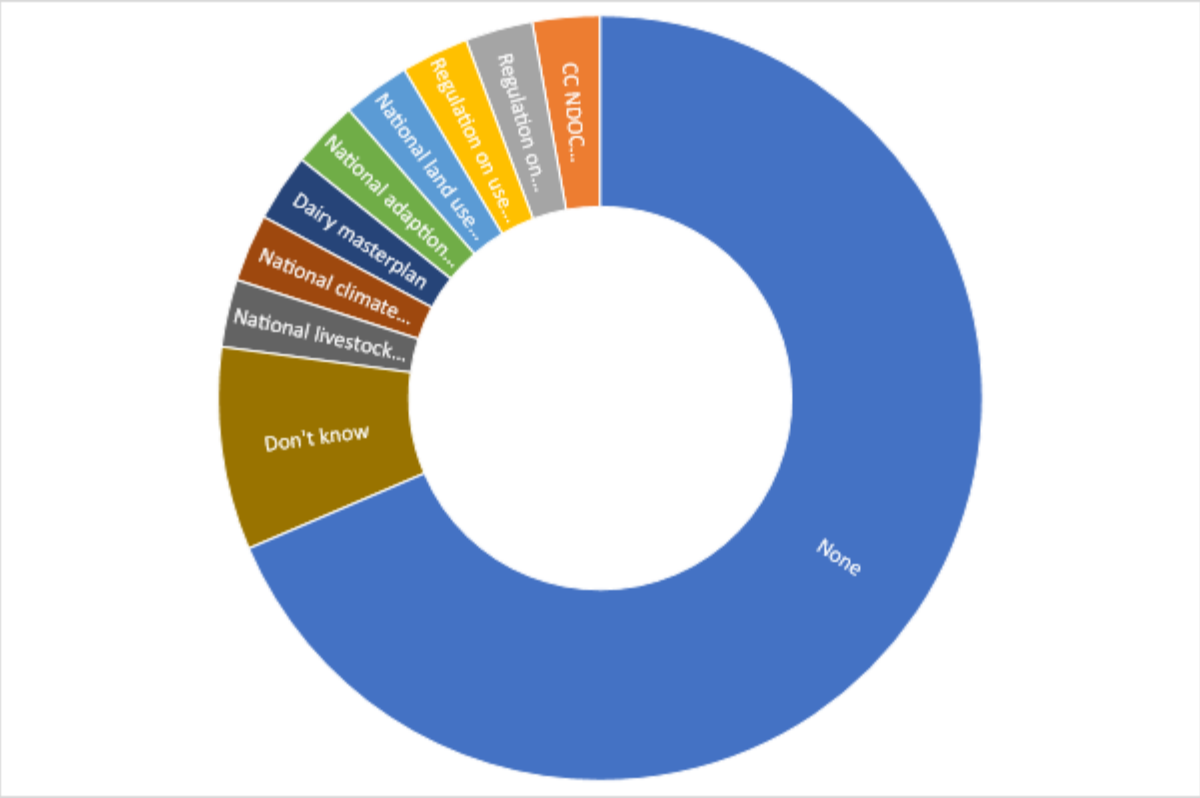
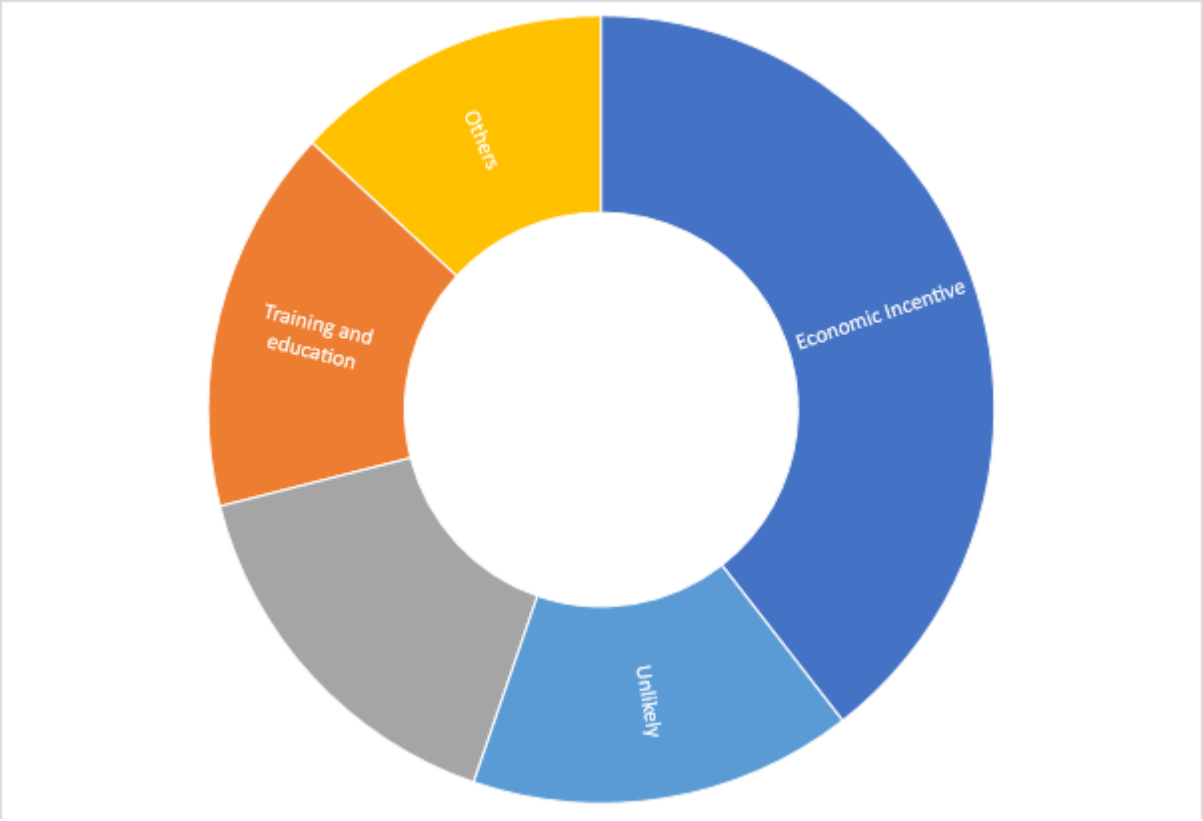


Figure 11.6. Question 44." In your opinion, how likely do you think farmers/commercial forage producers will adopt practices that will contribute to a better environment, but may require an investment? What will trigger them?"
For farmers to adopt and implement practices that will contribute to a better environment the respondents believe that farmers would do so if they get an economic incentive (47%). Other considerations included (i) increasing awareness by training and educating farmers (19%), and (ii) new policies and regulations to adopt practices which initially will need an investment (19%) (Survey Diagrams; Figure 11.6).

Fig. 11.6. Question 44. In your opinion, how likely do you think farmers/commercial forage producers will adopt practices that will contribute to a better environment, but may require an investment? What will trigger them? (Q44)



12. Innovations

Figure 12.1. Question 45. "During the past 5 years, you may have observed some of the innovations that are listed below. Please confirm by rating their impact (high, low, or not observed)".
A total of 16 different innovative activities were listed in the questionnaire and the respondents were asked to rate the impact of each innovation. Those considered as having a high impact were the following: (i) improved methods of forage production and preservation (> 50%), (ii) training (>50%), (iii) introducing new species (47.1%), (iv) improved hay production (44.1), (v) intensification and mechanisation (38%), balanced feed rations (38%), and conservation agriculture (38%). (Survey Diagrams; Figure 12.1).

Fig. 12.1. During the past 5 years, you may have observed some of the innovations that are listed below. Please confirm by rating their impact (Q45).

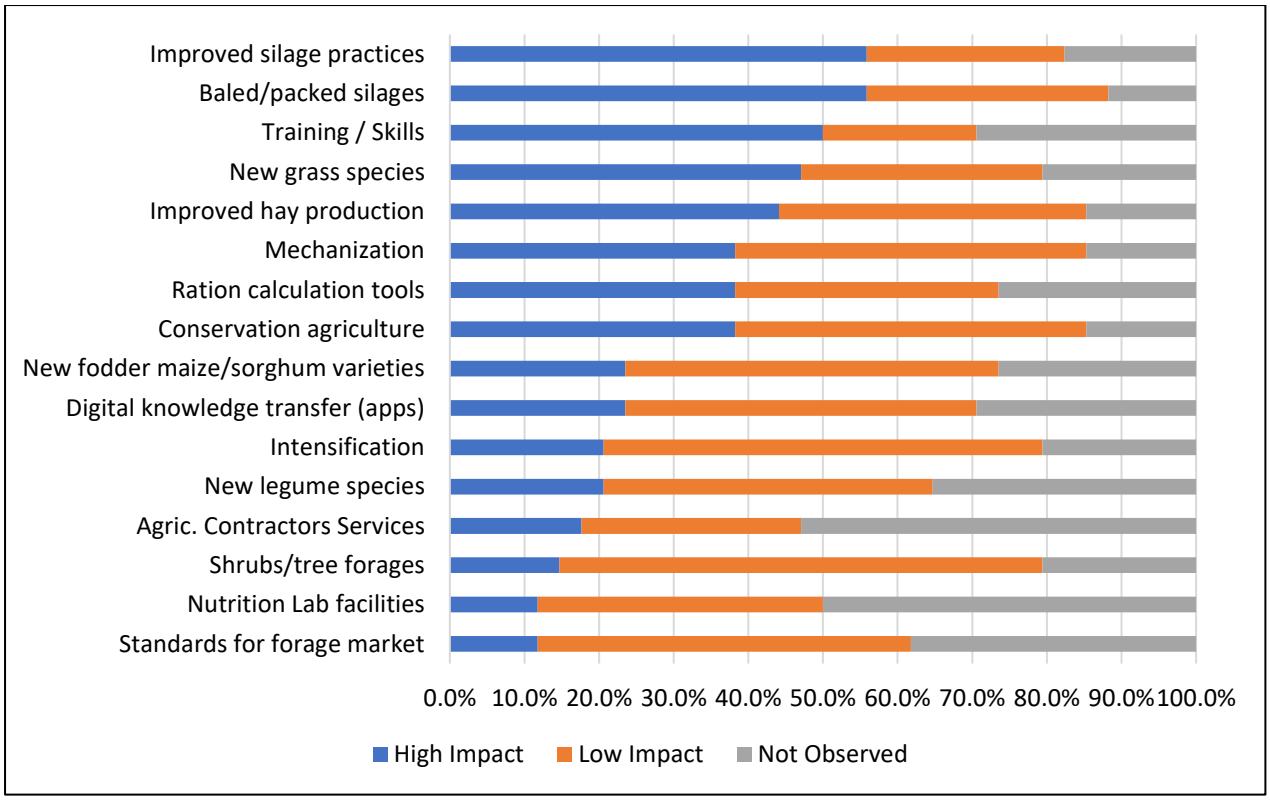


Figure 12.2. Question 46. "Which other innovations would you like to add Please indicate their impact (high/low)."
The respondents consider that, if the gap between the genetic potential of the dairy animal and the available quality of feed and forages is reduced, this would have a high impact (38.5%). Forage preservation technology (30.8%) and education & training (11.5%) were also mentioned as being high impact innovations. Others like feeding of the dairy animals, utilization of leguminous crops, better storage and feed manufacturing all scored below 10% (Survey Diagrams; Figure 12.2).

Fig. 12.2. Which other innovations would you like to add Please indicate their impact (high/low) (Q46)

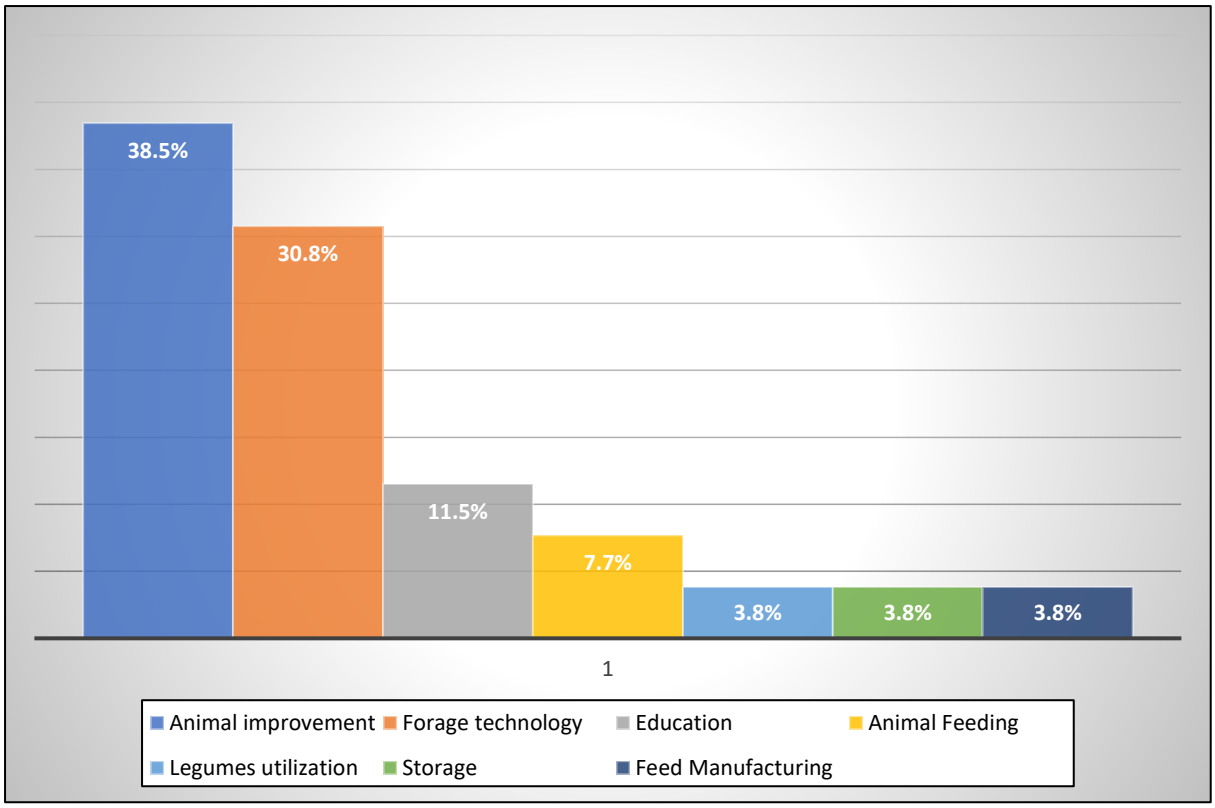
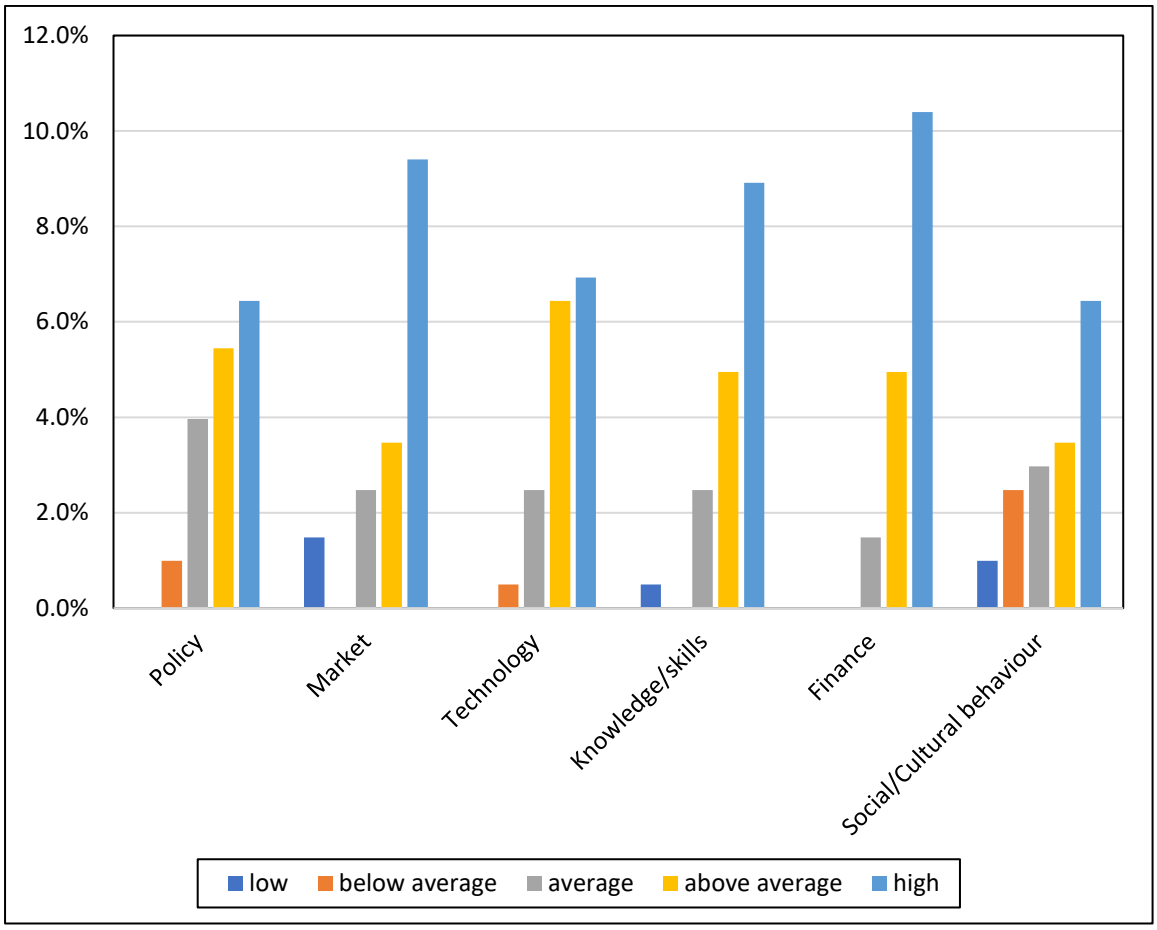


Figure 12.3. Question 47." What aspects need to be considered before a new intervention is introduced or put into action? Please rate from 1 - 5 and explain (1 = low importance, 5 = high importance)
According to the survey, all proposed aspects (policy, market, technology, knowledge and skills, finance, social/cultural behavior) need to be considered, especially with attention to finance, knowledge and markets (Survey Diagrams; Fig 12.3).

Fig. 12.3. Which other innovations would you like to add Please indicate their impact (high/low) (Q47).



Questionnaire

1. Introduction

This questionnaire is one of the tools that is used for the (dairy) Forage Quick Scans for Kenya, Uganda and Ethiopia, referred to in the covering letter. This is a project under the Netherlands East African Dairy Partner-ship (NEADAP) that includes Ethiopia, Kenya and Uganda.
In Kenya it is administered by SNV's Kenya Market-led Dairy Programme (KMDP). KMDP is funded by the Netherlands Embassy in Nairobi.
The questionnaire focuses on the current status of forage crops availability, production and preservation practices, technologies, and innovations. This includes forages produced and preserved by the farmer, by commercial forage producers and agricultural contractors.
The questionnaire further deliberates on relevant aspects that impact on the forage sub-sector, such as knowledge and skills level, market needs and demands by different farming systems, agro-ecology, availability of land and appropriate seeds, mechanisation level/needs, and other factors that impact on the performance of the forage sub-sector and – through it – on the dairy sector.
The questionnaire is designed for administration in Kenya, Ethiopia and Uganda. Please provide the following information as requested in the pages below for Kenya only.
The questionnaire, if so desired, allows you to answer part of the questions, exit and continue later from where you left. The answers to the questionnaire do not need to reflect the policies of the company/organization you work for and will be treated confidential.

The farming systems used in the questionnaire are based on different forage crops, grasses and how these forage crops are managed, used and/or fed in the different dairy farming systems. Other forage crops, like sorghum, maize or lucerne may be used across the 3 systems as a cut and carry crop or in a fully mechanized system.

- The first farming system - or maybe more appropriate fodder crop management system - we use in this questionnaire is zero grazing. This system – irrespective of farm size – is based on cut and carry fresh or preserved fodder crops, mainly grown by the farmers themselves.
- The second system: grazing - improved pasture is a system were particularly pasture grasses are used as forage crops either in a stall-fed system or a paddock system with cows grazing day and night or part of the day.
- The third system: natural grass land is contrary to the other 2 systems making use of the natural vegetation. This system is an extensive livestock management system characterized by a small number of Livestock Units (LU) per ha.

For any questions and submission of any other relevant reports or documents that you wish to share with us to consider for the Quick Scan, please contact:

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1. Please enter your email address

2. General Constraints

2. Select the **five** most important constraints that prevent an increase in forage production and preservation in Kenya.

- ☐ Forage policies
- ☐ Land tenure systems
- ☐ Land availability
- ☐ Milk market
- ☐ Seed/plant material availability
- ☐ Awareness, knowledge and skills
- ☐ Training/education
- ☐ Mechanisation
- ☐ Food/forage crop competition
- ☐ Contractor/service availability
- ☐ Financial matters
- ☐ Logistic-transportation-infrastructure

3. List at least **three** important reasons why in Kenya production of quality forages (high nutritive value) is still deficient.

1

2

3

4

5

3. Forage Species

4. What are the three most common forage species used by dairy farmers in different farming system?

Zero Grazing

Grazing Improved Pastures

Free Range-Natural Grassland

5. Which forage species, in order of importance, do you think give the best return for the dairy farmer in the different farming systems?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

6. What are the main constraints for forage production in the dairy farming systems and for commercial forage producers?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

Commercial Forage Producers

7. What new forage species (energy/protein rich) do you think can be introduced in the dairy farming systems?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

4. Forage Preservation

8. What are the **three** most common forage preservation methods used in the dairy farming systems and by commercial fodder producers?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

Commercial Forage Producers

9. List at least **three** most common causes for post-harvest losses in the forage production and preservation chain?

1

2

3

4

5

10. What farming practices can dairy farmers adopt to prevent or reduce harvest and post harvesting losses?

11. Which other conservation methods or technologies do you think could be introduced in the current dairy farming systems?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

Commercial Forage Producers

12. Which forage crops and preservation technologies are best suited to reduce the problem of seasonality?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

13. Where do you think commercial forage production will be developed in the future?

	Unlikely	Maybe	Very Likely
Highlands (>1200m)			
Midlands (800 –1200m)			
Lowlands/ ASAL (<800m)			
Urban and Peri-urban			

14. Where do you think commercial milk production will be developed in the future?

	Unlikely	Maybe	Very Likely
Highlands (>1200m)			
Midlands (800 –1200m)			
Lowlands/ ASAL (<800m)			
Urban and Peri-urban			

15. Which measures need to be taken - at various levels e.g. farm, policy, seed supply, mechanisation- to improve the quality or forages?

5. Forage-Seeds or Plant Material

16. In your opinion, what is the availability of the listed seeds/plant material in the market?

	Low availability	Medium availability	High availability
Kikuyu grass	☐	☐	☐
Napier grass	☐	☐	☐
Boma Rhodes grass	☐	☐	☐
Brachiaria grass	☐	☐	☐
Fodder Sorghum	☐	☐	☐
Fodder Maize	☐	☐	☐
Oats	☐	☐	☐
Vetch	☐	☐	☐
Lucerne	☐	☐	☐
Sesbania	☐	☐	☐
Calliandria	☐	☐	☐
Leucaena	☐	☐	☐
Tree Lucerne	☐	☐	☐
Desmodium	☐	☐	☐
African Foxtail	☐	☐	☐
Masaai Love grass	☐	☐	☐

Other (please indicate the availability (low, high or medium))

17. What are reasons for low availability of seeds in the market (incl. new varieties or species not yet registered in Kenya)?

18. How would you increase the availability of seed/plant material?

19. How would you engage dairy farmers to use improved forage seeds/plant material for planting?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

20. When improved forage seeds/plant material are available to benefit farmers, do farmers need to improve agricultural practices at the same time? If so list agricultural practices that are limiting quality forage production.

☐ No

☐ If Yes, Please list agricultural practices that are limiting quality forage production

6. Mechanisation of Forage Production

The following questions refer to the scale of dairy farms in relation to the level of mechanisation.

21. What is the mechanisation level for forage production and preservation for the **small holder** dairy farmers?

	Low	Medium	High
Maize and Sorghum	○	○	○
Boma Rhodes, Kikuyu, Starr grass,	○	○	○
Napier grass and Brachiaria	○	○	○
Lucerne and Oats	○	○	○

22. What is the mechanisation level for forage production and preservation for the **medium and large scale** dairy farmers?

	Low	Medium	High
Maize and Sorghum	○	○	○
Boma Rhodes, Kikuyu, Starr grass, Napier grass and Brachiaria	○	○	○
Lucerne and Oats	○	○	○

23. What do you think is the main mechanisation problem that is currently hindering the production, quality and utilization of forages on dairy farms?

Zero Grazing

Grazing – Improved pastures

Free Range – Natural grassland

Commercial fodder producers

24. Would you prefer to promote on-farm mechanisation or use of skilled contractors with appropriate machinery in different dairy systems?

	On-farm mechanisation	Skilled Contractors	Both
Zero Grazing	○	○	○
Grazing – Improved pastures	○	○	○
Free Range – Natural grassland	○	○	○

25. What solutions do you suggest for enhanced mechanisation of forage production and preservation in small holder, medium and large scale dairy farms?

Small holder dairy farms

Medium and large scale dairy farms

7. Service Providers and Input Suppliers

26. What is your perception of the quality of the input suppliers and service providers in relation to forages, on a scale of 1 - 5 (1 = poor, 5 = excellent)?

	1	2	3	4	5
Seed/plant material supply	○	○	○	○	○
Training and advisory	○	○	○	○	○
Mechanisation services	○	○	○	○	○
Supply of inputs for silage Making (plastic, inoculant)	○	○	○	○	○
Agricultural contractors	○	○	○	○	○
Laboratories for feed testing	○	○	○	○	○

27. Which services, according to you, are missing in the Kenyan forage market?

28. What improvements are required at the level of input suppliers and service providers to achieve improved availability and quality of forages?

Seed/plant material supply

Training and advisory

Mechanisation services

Supply of inputs for silage making (plastic, inoculant, others)

Agricultural contractors

Laboratories for feed testing

8. Forage Market

29. What kind of forages can you find nowadays being offered for sale in the market (e.g. fresh/green forages, imported forages, grass hay, wheat straw, silage, etc.)?

30. How would you define the actual forage market (e.g. seasonal, opportunistic, formal/informal, quality control, standards, etc.)?

31. What opportunities and bottlenecks are there in the commercialisation of forages?(List at least three in order of importance)

Opportunities

Bottlenecks

32. What improvements and changes need to be made by commercial forage producers to improve forage production in terms of yield and quality?

Quality	
Yield	

33. What affects production levels and cost price of raw milk mostly: the quality of forages or of compounded feeds (please explain)?

34. What is your opinion on the opportunity of forage production in agro-forestry systems?

On-farm

As a forage crop for commercialisation

9. Education and Training

35. What is the availability and quality of education and training on forage production, preservation and inclusion of dairy cow ration formulation in the country?

36. What knowledge and skills are lacking in regards to forage production and preservation?

37. Who should provide this training?

38. Who should be trained?

- ☐ Farmers
- ☐ Commercial fodder producers
- ☐ Training and extension staff
- ☐ Farm workers
- ☐ Agricultural contractors
- ☐ Dairy nutrionists
- ☐ Other (please specify)

10. Environmental Footprint

39. How do you rate the effect on the environment of current agricultural practices as regards forage production and preservation?

Positive	Neutral	Negative
○	○	○

40. What is in your opinion the contribution of current forage production and preservation towards an environmental sustainable dairy industry?

Positive	Neutral	Negative
○	○	○

41. Which good practices, interventions would you recommend as regards the forage sub-sector to reduce the (negative) impact on the environment?

42. What other recommendation do you have – beyond forage production and preservation - for reduced environmental footprint for the Kenyan dairy industry?

43. Are there any regulations/policy requirements in place that you are aware of to reduce the environmental impact of livestock production systems (national or county level)?

44. In your opinion, how likely do you think farmers/commercial fodder producers will adopt practices that will contribute to a better environment, but may require an investment? What will trigger them?

11. Innovations

45. During the past 5 years you may have observed some of the innovations that are listed below. Please confirm by rating their impact (high, low, or not observed)

	High Impact	Low Impact	Not Observed
New legume species	○	○	○
New grass species	○	○	○
New fodder maize/sorghum Varieties	○	○	○
Shrubs/tree forages	○	○	○
Improved silage practices	○	○	○
Improved hay production	○	○	○
Baled/packed silages	○	○	○
Standards for forage market	○	○	○
Intensification	○	○	○
Mechanisation	○	○	○
Nutrition Lab facilities	○	○	○

Agric. Contr. Services	○	○	○
Digital knowledge transfer (apps)	○	○	○
Ration calculation tools	○	○	○
Training / Skills	○	○	○
Conservation agriculture	○	○	○

46. Which other innovations would you like to add? Please indicate their impact (high or low).

47. What aspects need to be considered before a new intervention is introduced or put into action? Please rate from 1 - 5 and explain (1 = low importance, 5 = high importance)

	1	2	3	4	5
Policy	○	○	○	○	○
Please explain					
Market	○	○	○	○	○
Please explain					
Technology	○	○	○	○	○
Please explain					
Knowledge/skills	○	○	○	○	○
Please explain					
Finance	○	○	○	○	○
Please explain					
Social/Cultural behavior	○	○	○	○	○
Please explain					

NEADAP

NETHERLANDS EAST AFRICAN DAIRY PARTNERSHIP

Milk Quality

Forage & Nutrition

Inclusive Business Models

Networking & Influencing

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